PB 203 341

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BIBLIOGRAPHIC DATA SHEET	1. Report No. AP-100	2.	3. Recipient's Accession No.

4. Title and Subtitle
Hydrochloric Acid and Air Pollution: An Annotated Bibliography

5. Report Date
July 1971

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Office of Technical Information and Publications
Air Pollution Technical Information Center
Office of Air Programs
Research Triangle Park, North Carolina 27711

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address
Environmental Protection Agency
Office of Air Programs
Research Triangle Park, North Carolina 27711

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstracts

Approximately 164 abstracts of publications on hydrochloric acid, are presented in this bibliography - The abstracts are represented in the following categories: Emission sources; Atmospheric interaction; Measurement Methods; control methods; Effects on human health. Effects on plants and livestock, Effects on material; Effects on economics; Legal and administrative; Standards and criteria; Basic science and technology.

17. Key Words and Document Analysis. 17a. Descriptors

Bibliographies
Air pollution
Hydrochloric acid
Atmospheric contamination
Air pollution control equipment
Atmospheric contamination control
Economic factors
Legislation

17b. Identifiers/Open-Ended Terms

Air pollution effects (animals)
Air pollution effects (plants)
Air pollution effects (materials)
Air pollution control
Air pollution detection

17c. COSATI Field/Group 13B

18. Availability Statement Available from Superintendent of Documents Washington, D. C. 20402 EP4.9:100	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 111
	20. Security Class (This Page UNCLASSIFIED	22. Price .55

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HYDROCHLORIC ACID
AND AIR POLLUTION:
AN ANNOTATED BIBLIOGRAPHY

Office of Technical Information and Publications
Air Pollution Technical Information Center

ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Research Triangle Park, North Carolina
July 1971

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Stock Number [illegible]

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Office of Air Programs Publication No. AP-100

HYDROCHLORIC ACID AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

This bibliography contains 164 abstracts of documents and articles on Hydrochloric Acid. These abstracts are numbered sequentially on their upper right corner. The number on the upper left corner is the APTIC accession number.

An author index, a title index, a subject index, and a geographical location index follow the abstracts. The author index lists all authors individually. The first author is indicated by an asterisk (*). The indexes refer to the abstracts by the number on their upper right corner.

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Office of Air Programs, Research Triangle Park, North Carolina 27711. Readers outside the Office of Air Programs (OAP) may seek duplicates of documents directly from libraries, publishers, or authors.

GENERAL

04212 1

S. Abe

THE PRESENT STATUS OF AIR POLLUTION. Clean Air Heat Management (Tokyo) 15, (7-8) 7-18, Aug. 1966. Jap.

The present status of air pollution in Japan is given naming the kinds of contaminants and their origin, factors affecting contamination density, and various types of smog. The types of contaminants are: 1) minute particles (less than 1 micron in size) such as found in soot, carbon, ashes, dust; 2) coarse particles (greater than 1 micron in size), as found in dust, ashes, and minerals; 3) reactive substances found in mist, fog, and vapor such as SO_2, SO_3, H_2S, CO_2, CO, NO_2, N_2O_3, O_3, aldehydes, HCl, NH_3, HF, Pb, Hg, Cd, As, Be and 3, 4-benzpyrene. The contaminants originate from factories, chemical plants, power stations, domestic heating, public baths, hotels, laundries, dry cleaning establishments, hospitals, schools, and public buildings. Also discussed are the human factors affecting air pollution such as public awareness and interest, seasonal, weekly, and daily changes in heating and cooking. Meteorological aspects are covered such as wind direction and velocity, turbulence, temperature, rain and snow. The types of smog found in New York, London, Los Angeles, Pittsburgh, and Yokkaichi are described. Graphs and tables list symptoms and diseases affecting plants and humans and give the density of dust particles and SO_2 in the main cities of Japan. Data on the sulfur content of various oils produced by Japanese refineries and on the number of Japanese automobiles produced is included for information on emission sources of pollutants.##

EMISSION SOURCES

15392 2

Bean, Samuel L. and Howard Wall, Jr.

ATMOSPHERIC EMISSIONS FROM HYDROCHLORIC ACID MANUFACTURING PROCESSES. Public Health Service, Durham, N. C., National Air Pollution Control Administration and Manufacturing Chemists Association, Washington, D. C., Pub. AP-54, 59p. Sept. 1969. 15 refs.

The basic characteristics of the manufacture of hydrochloric acid are presented, including growth rate of the industry, manufacturing processes, product uses, and the number of producing plants in the United States. The Mannheim, Hargreaves, and Laury processes are discussed with respect to their historical interest, even though the number of plants that use them is decreasing. The concentration of hydrogen chloride emitted to the atmosphere is usually less than 0.5% of the tail gas volume emitted to the atmosphere. Emissions from hydrochloric acid plants are adversely affected by high temperatures in the absorption system, improper balance of absorption area and contact time, faulty equipment, and inadequate tail gas scrubbing systems. No correlation exists between exit gas volumes and plant production rates because of the diverse methods of production. However, smaller volumes of exit gas usually show greater hydrogen chloride concentrations due to the varying amounts of inert materials in this gas stream. Thus, the amount of hydrogen chloride emitted in pounds per ton of acid produced gives a more accurate description of the contaminant emissions. The hydrogen chloride emissions are usually reduced by scrubbing in a packed tower located behind the process tower. Water scrubbers can reduce the concentration to less than 0.1 pound per ton of acid produced. Hydrogen chloride absorption systems include falling film and adiabatic absorbers. Other contaminants such as chloride, chlorinated organic compounds and other hydrocarbons emitted to the atmosphere are mentioned.

09275 3

Bohne, Helmut

IMMISSION DAMAGE CAUSED BY HOSPITAL WASTE INCINERATION. STAUB (English translation), 27(10):28-31, Oct. 1967. 4 refs.
CFSTI: TT 67-51408/10

The strong decolorization and whitening of plants observed in two gardening nurseries were caused by hydrogen chloride. In both cases the sources of emission were refuse incineration plants of hospitals in which chlorine compounds in the refuse, consisting 80-

90 percent of paper and packaging material, were decomposed during short periods at a temperature of 800 - 1,000 deg C. Erection of chlorine washing plants appears, therefore, to be necessary. (Author's summary)##

17015 4

Bondareva, E. N. and V. Z. Yas'kova

HYGIENIC EVALUATION OF ATMOSPHERIC AIR POLLUTION IN THE VICINITY OF THE INDUSTRIAL PLANT 'KRASNYI KHIMIK'. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:115-119, 1963. (B. S. Levine, ed.)
CFSTI: 63-11570

Air around a chemical plant producing hydrochloric and sulfuric acid was analyzed for concentrations of sulfuric acid aerosol sulfur dioxide, and hydrochloric acid. The sulfuric acid concentrations of samples collected 1000 meters from the plant were 1300% times above allowable limits. Maximum HCL concentrations were found only 200 meters away, and were 1-12 times as great as allowable concentrations. At 500 and 1000 meters, HCL concentrations were minimum but always associated with SO2 and sulfuric acid. All air samples had high sulfur dioxide concentrations, particularly those collected in cold, cloudy weather and on foggy summer days. Under normal conditions, SO3 was present in concentrations from 0.0007-0.6 mg/cu m. Caged rats placed within 300 and 500 meter radii from the plant along the path of prevailing winds showed reduced cholinesterase activity and reduced vitamin C concentrations in the adrenals. There was a slight increase in vitamin C concentration in the liver and kidneys.

01416 5

J. S. Carter

CHIMNEY DISPERSAL OF INDUSTRIAL WASTE GASES IN THE 19TH AND 20TH CENTURIES. Public Health Inspector (London) Vol. 73:405-410, July 1965.

The history of stacks for dispersal of industrial waste gases in Great Britain is reviewed.##

09844 6

Chatfield, Harry E.

RESIN KETTLES. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 681-688, 1967.
GPO: 806-614-30

Aspects of resin (plastic) production such as chemical reactions, reaction conditions, equipment, and operating procedures are discussed for phenolic, amino, polyester, and alkyd, polyurethane, polyvinyl, polystyrene, and petroleum and coal tar plastics. The principal air contaminants and sources of emission from resin manufacturing operations are tabulated. The usual emission control equipment types are cyclones and spray towers for particulates, and reflux condensers and water scrubbers for solvent fumes.

02234 7

CHEMICAL INDUSTRY REPORT (REVISED INFORMATIVE REPORT NO. 1). J. Air Pollution Control Assoc. (TI-2 Chemical Committee). 13, (10) 496-9, Oct. 1963,

The chemical industry uses raw materials from mine, forest, sea, air, and farm; from oil, brine and gas wells; and from by-product materials of many other industries. It converts these widely diversified raw materials into more than 8,850 compounds, called "end chemicals," in more than 12,000 plants operated by hundreds of chemical manufacturers. Since World War II the chemical industry has become so diversified that it is difficult even to classify it accurately. Today, petroleum producers are now important chemical manufacturers; paper companies, rubber companies, even manufacturers of electrical machinery and farm equipment are chemical producers. This report will discuss in general terms some of the characteristics of emissions from certain kinds of operations and the relation of the plant operators to the Air Pollution Control Officials.##

18027 8

Cornish, Herbert H. and Ellen L. Abar

TOXICITY OF PYROLYSIS PRODUCTS OF VINYL PLASTICS. Arch. Environ. Health, 19(1):15-21, July 1969. 12 refs.

Polyvinyl chloride polymers and formulations were pyrolyzed in a stream of air by gradually raising the temperature from ambient to approximately 600 C. The pyrolysis air stream was diluted with twice its volume of room air, and rats were exposed to it. Exposure to an air stream containing the pyrolyzed products of 1 to 2 gm of polyvinyl chloride polymer resulted in the death of 50 percent of the animals. Most deaths were due to carbon monoxide (CO), and carboxyhemoglobin (COHb) levels correlated well with the amount of plastic pyrolyzed. Little histological evidence of lung damage was evident. When oxygen (O2) was added to the air stream to prevent deaths from CO, pulmonary edema and interstitial hemorrhage developed. The lungs of some animals exposed to high levels of pyrolysis products of vinyl chloride-vinyl acetate copolymer also showed focal edema and intra-alveolar hemorrhage. Polyvinyl chloride formulations, containing additives and inert materials, were in general less toxic per gram of sample pyrolyzed. (Author's Abstract)

16521 9

Tokyo Metropolitan Government, Japan, Public Nuisance Control Div.

THE EMISSION SOURCES OF HCl AND NH3 AND THEIR STANDARD CONTROL EQUIPMENTS. (Enka suiso oyobi anmonia no hasseigen to sono hyojun jogai shisetsu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):461-466, Aug. 15, 1966.

Hydrogen chloride is emitted by plants which produce pigments, dyes, industrial chemicals, medical supplies, and treat metal surfaces. Ten to 50 ppm HCl does not prohibit work, but is harmful to the teeth, nose, mucosa of the mouth, and face after long exposure. No one can work in air containing 50-100 ppm HCl. Ammonia is emitted by plants which produce pigments, manures, and medical supplies. Odor is noticed when the concentration reaches 100 ppm NH3. Chronic exposure to 400 ppm NH3 is harmful to the mucosa. Exposure to concentrations of 2500-6500 ppm NH3 for 30 minutes is dangerous, and exposure to concentrations of 5000-10,000 ppm NH3 quickly causes death. Hydrogen chloride and NH3 can be removed by absorption, adsorption, chemical reactions, and oxidation. Hydrogen chloride and NH3 dissolve easily in water which provides another suitable method for control. The water washing method is divided into a packed column, spray column, venturi scrubber and jet scrubber. The washing equipment consists of an air blower, a cleaning column, a pump, a water tank, and an exhaust pipe. The parts which come into contact with the gas must be constructed of an acid-alkali proof material. A mist catcher must be installed on top of the packed column. The hood must be carefully designed so the excess air is not inhaled. (Author abstract modified)

10748 10

Fenimore, C. P., and G. W. Jones

COMPARATIVE YIELDS OF SOOT FROM PREMIXED HYDROCARBON FLAMES. Combust. and Flame, 12(3):196-200, June 1968.

Ethylene and acetylene gave eight times more soot when burnt with oxygen. The comparison was made in flames having the same temperature, and about the same pack concentrations of species from which the soot is supposed to grow (hydrocarbon radicals, acetylene and polyacetylene). We suggest that more effective oxidation of the soot aggregates, particularly during their early stages of growth occurred in oxygen flames, and this decreased the yield. Hydrogen chloride added to acetylene-oxygen flames increased the yield of soot without increasing the concentrations of polyacetylenes. Here too, the yield may have been altered mainly by changes in the oxidation of the early soot aggregates. (Authors' abstract)##

12440 11

Gortan', G. M. and V. D. Yablochkin

ON THE QUESTION OF IMPROVING SOME POLYVINYL CHLORIDE POLYMERS AND A METHOD OF IMPROVING THEIR TOXICITY. Kosmich. Biol. Med., 1(2): 47-51, Mach-April 1967. 11 refs. Translated from Russian by E. Harter, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 8p., April 15, 1968.
CFSTI,DDC: AD 680924

Polyvinyl chloride insulation tapes are used to equip airtight closed spaces of small dimensions and the cabins of spaceships with electronic apparatuses. A method was developed for improving the polyvinyl chloride tapes for the purpose of decreasing their gas emanation. The overall gas emission or organic substances from the improved specimens of polyvinyl chloride tapes as a result of the treatment with 50% urea solution was reduced by a factor of 1.5. The improved polyvinyl chloride tapes gave off volatile chemical substances in small concentrations, which with long duration of their action on the organism cause only a weak biological effect. As a result of the treatment with a solution of urea, there was an improvement in the electrical insulation properties of the polyvinyl chloride tapes serving the purpose for which the materials were intended without change in their strength characteristics. The following gases are emitted from polyvinyl chloride tapes: aldehyde, carbon dioxide, dibutyl phthalate, fatty acids, carbon monoxide, hydrocarbons, hydrogen chloride, and organic chlorine compounds; their concentrations are recorded.

09799 12

Hammond, William F. and Herbert Simon

SECONDARY ALUMINUM-MELTING PROCESSES. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 284-292, 1967.
GPO: 806-614-30

The secondary aluminum melting process is described in detail indicating the type of furnaces used, charging practices, pouring practices, and fluxing. Frequently a large part of the material charged is low-grade scrap and chips. Paint, dirt, oil, grease, and other contaminants from this scrap cause large quantities of smoke and fumes to be discharged. Even if the scrap is clean, large surface to volume ratios require the use of more fluxes which can cause serious air pollution problems. The emissions from aluminum fluxing may consist of hydrogen fluoride, hydrogen chloride, chlorine in the gaseous state, aluminum chloride, magnesium chloride, aluminum fluoride, magnesium fluoride, aluminum oxide, magnesium oxide, zinc chloride, zinc oxide, calcium fluoride, calcium chloride and sodium chloride in the solid state. Because of the widely divergent properties of these air contaminants the problem of control is complicated. A canopy hood is usually used for capturing the emissions from the charging well of aluminum reverberatory furnaces. Calculation of the quantity of air required can be accomplished as shown in an example. Some type of scrubber is required to remove the soluble gaseous fraction of the effluent, and either a baghouse or an electrical precipitator is needed to control the solids. In order to maintain adequate collection efficiency, the use of high efficiency scrubbers with a caustic solution as the scrubbing medium has been found necessary. Typical test data on collection efficiency for both ordinary and high-efficiency scrubbers are outlined. Average collection efficiencies obtained on various devices on emissions from chlorinating aluminum are outlined. The devices are horizontal multipass wet cyclone, single-pass wet dynamic collector, packed-column water scrubber with limestone packing, ultrasonic agglomerator followed by a multitube dry cyclone, and an electrical precipitator. The trend in control equipment for aluminum-fluxing emissions appears to be away from electrical precipitators and toward the scrubber-baghouse combination.

20646 33

Hirayama, Naomichi, Kazuo Nishida, Sadao Kosuno, and Toshio Ohira

A RESEARCH ON THE REFUSE INCINERATORS FROM THE VIEWPOINT OF SMOKE PROPERTIES. Bull. JSME (Japan Soc. Mech. Engrs.), 11(47):902-912, 1968. 4 refs.

Operating conditions, type of refuse burned, concentrations of noxious flue gas components, and the amount of dust and fly ash in flue gases were determined for 15 municipal and private incinerators in Tokyo. Integrated test results are tabulated and evaluated in terms of incinerator design criteria. Concentrations of hydrogen chloride were high where rubbish was burned, sometimes reaching 2000 ppm in emissions from department store incinerators. This amount renders furnace design almost impossible due to the metal corrosion. The concentration of HCl in the flue gas of municipal incinerators is usually less than 200 ppm, so attention should be paid to high temperature incineration and stress corrosion of metals. The total of sulfur oxides in flue gas from incinerators is less than 100 ppm. Ammonia is not produced by rubbish combustion, and that produced by garbage combustion can be substantially reduced by high-temperature incineration, as can concentrations of aldehydes. Temperature has no effect on organic acids, the total content of which is usually less than 100 ppm, but high temperatures (above 900 C) produce increased concentrations of nitrogen dioxides. The dust and fly ash content in the flue gas of continuous combustion incinerators are nearly equal to that of the batch combustion type. The ash content can be controlled by retaining the ash on the afterburning grate for a sufficient period of time. With respect to dust, dry collectors are preferable for refuse incinerators.

02236 34

HYDROCHLORIC ACID MANUFACTURE, REPORT NO. 3. J. Air Pollution Control Assoc. 13, (10) 502-5,7, Oct. 1963. (TT-2 Chemical Committee.)

This report, published as Informative Rpt. No. 3 of the Air Pollution Control Association's TT-2 Chemical Committee represents the "best thinking of the Association" on the subject. The manufacture of hydrochloric acid involves the generation of hydrogen chloride gas and its absorption in water for the aqueous solutions. There are three principal processes used to produce hydrogen chloride: (1) Reaction of salt and H2SO4 (Mahnheim Process) resulting in the production of hydrogen chloride gas and sodium sulfate; (2) Burning chlorine in a slight excess of hydrogen; (3) As a by-product from chlorination of organic compounds. Up until the early thirties more acid was made by the salt-acid process; by 1961 the hydrogen-chlorine process was more in use. Air pollution aspects of the processes are reviewed.##

19325 **15**

Konda, Kiyoshi, Hisao Ito, and Atsuhiro Honda

FIELD EVALUATION OF EXHAUST GAS FROM REFUSE INCINERATOR RELATED TO AIR POLLUTION AND METAL CORROSION. Trans. Soc. Heating, Air-Conditioning, and Sanitary Engrs. (Japan), vol. 7:95-104, 1969.

A study of municipal incinerator exhaust gas composition conducted at five sites in Japan is described. The study was undertaken to obtain information on odor and metal corrosion problems. The exhaust consisted of sulfur oxides, nitrogen oxides, ammonia, sulfuric acid, nitric acid, organic acids, and hydrochloric acid. Volatile organic acids and hydrochloric acid are mainly responsible for the corrosion, with sulfuric and nitric acids only partially concerned. Percentages of exhaust products as a function of raw refuse input are tabulated. Continuous firing rather than batch firing would limit noxious effluents. Temperature and excess air control would also help. After-burning chambers should be installed to further reduce contaminants.

01741 **16**

E. Mastromatteo

HEALTH ASPECTS IN FIRE FIGHTING (PART 1). Firemen 33, (6) 20-1, Aug. 1966.

In the course of their work, fire fighters are exposed to a variety of toxic fire gases and other adverse health factors. Quite often they are required to enter buildings, confined spaces, and other places where they may be exposed to extremes of heat, to smoke, to oxygen lack, and to toxic gases created by the combustion process. The physical exertion, excitement and anxiety involved in many fire situations add to the health problems by increasing the breathing and heart rates. Fire fighting therefore can place severe demands on the respiratory, cardio-vascular and nervous systems. Some of the chief health hazards encountered in fire fighting are discussed. Reference is also made to a special study of heart and lung disease in fire fighters. (Author summary)##

11438T **17**

Moegling, E.

PRACTICAL ASPECTS OF REFUSE INCINERATION ON THE EXAMPLE OF ESSEN-KARNAP. ([Praxis der zentralen Mullverbrennung am Beispiel Essen-Karnap.]) Translated from German. Brennstoff-Waerme-Kraft, 17(8):383-391, Aug. 1965. 7 refs.

Various aspects involved in the planning of refuse incineration plants are discussed. Detailed data of the Essen-Karnap power plant which serves a very wide area of refuse collection, are given. This plant is the largest refuse incineration plant existing at present. It has a capacity of 2000 tons of domestic and industrial refuse and 2000 tons of sludge per day. Performance data, components of the refuse power plant, supply and storage facilities for household refuse, discharging of refuse, refuse transportation and loading, incineration of used oils, slag transportation and treatment, and furnace operation are described. Simultaneous co-incineration of high-calorific value industrial refuse is being attempted experimentally. A large portion of the acid-forming ingredients undergoes chemical reaction with the refuse slag and fly ash originating from powdered coal firing, thereby reducing the emission of SO2, SO3, HCl, etc. into the flue gas. The aim is to establish a ratio of industrial wastes to domestic refuse which will provide the desired flue gas composition. At present refuse to be incinerated must contain less than 1% sulfur.**

55568 18

Rozen, C., A. Locquaniti, and I. Pettinati

EVALUATION OF THE RISK PRESENTED BY INDUSTRIAL POISONS. (Evaluation du risque induit par les toxiques industriels). Text in French. Arch. Maladies Profess. Med. Trav. Securite Sociale, 31(3):141-146, March 1970.

The determination of the actual concentration of a pollutant in air leads to accurate, reproducible results only when certain factors that affect it are taken into account. Thus, as in processing a sample of polluted air, the pollutant must be absorbed completely by the absorbent used in its determination. It is essential to know that the bubbling rate of the air sample through the absorbent liquid has a significant effect on the amount of pollutant absorbed in the process. A potential source of incorrect interpretation of results of perhaps otherwise accurate measurements is the assumption of a uniform distribution of the pollutant throughout a given enclosed space while its actual distribution is nonuniform. These two findings and those to follow are illustrated by results of measurements of concentrations in air, in mg/cu m of hydrochloric and hydrocyanic acids, ammonia, sulfur dioxide, and trichloroethylene. Another important factor was discovered after a small hermetically sealed test room had been constructed for experiments in an atmosphere with known pollutant contents. Their measured actual contents in the test-room air were appreciably smaller than the theoretically expected ones. Analogous results were obtained when air samples were taken by small Draeger tubes and when the masonry walls of the test room were replaced by walls made of aluminum sheets. That some of the pollutant introduced into the air of the room is deposited on the walls was fully confirmed by a test in which an aluminum plate of known surface area was attached to the wall and the amount of pollutant deposited on it during the test was determined analytically. When 'flushed' with fresh air this amount progressively decreased, as expected. Such 'contaminated' walls may act as secondary sources of air pollution.

06299L 19

Bureau of Mines, Pittsburgh, Pa., Coal Research Center. (1966). pp. 88/41-88/50.

POLLUTION BY CHLORINE IN COAL COMBUSTION. (SECTION V OF AIR POLLUTION RESEARCH PROGRESS REPORT FOR QUARTER ENDED DECEMBER 31, 1966.)

The ash content in coal is undesirable. Not only is it a diluent of the coal substance, but at the temperature of coal combustion some of the more volatile components are released to contaminate the combustion products. The interest in the contribution of chlorine to contamination of flue gas has been considerably less than the sulfur compounds. It was known that high-chlorine coals when carbonized cause attack on refractories and when burned cause fouling of high-temperature heating surfaces. The chlorine content of American coals range from 0.01 to 0.5 percent, whereas English coals run as high as 1 percent. Western coals contain no chlorine; chlorine is confined to Central and Appalachian coals--closer to our large urban centers. In burning coals containing chlorine a serious pollution hazard exists. Assuming that an 800-MW power plant is burning a 0.3 percent chlorine coal, 11,000 standard cubic feet an hour of hydrogen chloride are discharged from the stack each hour or 6,540 tons each year. If chlorine in coal is a possible pollutant, the nature of the chlorine compound in the coal should be known, as well as the transformations occurring during the coal-combustion process. This information is necessary if one is to consider techniques in the removal of the chlorine content before or after combustion. The concentration of hydrogen chloride is, however, dependent upon the degree of volatilization of the sodium, from the ash, as sodium chloride.**

20364 20

Reh, L.

INCINERATION AND THERMAL CRACKING OF LIQUID AND PASTYOUS REFUSE. (Verbrennung und thermische Spaltung fluessiger und schlammfoermiger Industrie-Abfaelle). Chem. Ing. Tech. 39(4):165-171, 1967. 22 refs. (Presented at the 120th Dechema Meeting, Frankfurt/Main, April 1, 1966.) Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa. Science Info. Services, 23p.

The following are the decisive factors in selecting the method, the furnace system, and the reaction conditions for incineration or thermal cracking of industrial sludges: combustibility, volatility, and toxicity of the individual components; the water content; the mineral substances; and corrosive compounds. The most common types of furnaces (such as combustion chambers, story of fluidized bed furnaces) are surveyed, and their design, mode of operation, and field of application are discussed. Most incinerator plants use both combustion and thermal cracking. The legal requirements of total residueless combustion of all toxic organic components demand combustion temperatures of at least 800 C in the actual combustion zone of the furnaces. With many residues, this temperature cannot be reached without auxiliary fuel. A rotary burner, spray burner, an atomizing nozzle, a story furnace, and a fluidized bed furnace are illustrated. The fluidized bed incineration with a turbulent layer of inert material may be also used for thermal cracking of waste sulfuric acid from inorganic or organochemical plants. The waste acid concentrated to an acid contents of 45% (including solid substances, mostly sulfates) is pumped into the turbulent layer of sand, heated by an auxiliary burner, and cracked to water vapor, O2, and SO2. The sulfates are converted to oxide, and organic substances are incinerated. The spent hydrochloric acid and iron chloride containing pickling baths are thermally cracked.

17464 21

REMARKABLE MEASURES FOR THE IMPROVEMENT OF AIR QUALITY. (Beachtliche Massnahmen zur Verbesserung der Luft). Text in German. Wasser Luft Betrieb, 14(1):33-36, Jan. 1970.

In 1967, a total of 4 million tons of sulfur dioxide were emitted from industrial sources, particularly power plants. Until 1975, an increase to 5 million tons is anticipated; from then on, the SO2 emission will stagnate and eventually decline, due to the use of nuclear power. Contrary to this downward trend, fluorine, chlorine, hydrocarbons and numerous odorous pollutants are on an upward trend, due to the expanding chemical industry. In the metallurgical industry, the sinter capacity has been doubled; thus, the larger units will emit HCl and larger quantities of gaseous fluorine compounds along with SO2. It is estimated that sintering plants presently already emit as much fluorine compounds as the aluminum plants. No fluorine removal method from the waste gases of the ore sintering plants is yet available. Traffic will further increase, as well as vehicle emissions. Emissions by domestic heaters will decrease because electric or central heating will take the place of old coal or oil fired heaters. To combat the increasing pollution of air by an overall increase of emissions, the state of North-Rhine-Westphalia plans to establish emission inventories. Such inventories have been made in the area around Cologne; other large cities will soon follow.

11123 22

Little (Arthor D.) Inc., Cambridge, Mass.

RESEARCH ON CHEMICAL ODORS. PART I -- ODOR THRESHOLDS FOR 53 COMMERCIAL CHEMICALS. Manufacturing Chemists Association, Washington, D.C., 26p., Octo. 1968

The odor thresholds in air of 53 industrial chemicals were determined by panel test. The odor threshold concentrations for the chemicals studied are tabulated in this report as an alphabetical listing and by increasing threshold concentrations. All concentrations are calculated as parts per million by volume. These values are reported for 50 percent and 100 percent (two and four members) panel recognition. Based on our experience in odor measurement, it is recommended that the concentrations given for 100 percent recognition should be considered as the recognition threshold values. The spread between 50 percent recognition may be indicative of the individuality of the odor type as well as the constancy of the data obtained. With 27 of the samples examined, 50 percent recognition was equal to the 100 percent recognition concentration, while in 23 instances the 50 percent recognition was once concentration interval lower than the 100 percent recognition.

11087 **23**

Rispoli, Jose A.

FIGHT AGAINST AIR POLLUTION IN ARGENTINA EDUCATIONAL, LEGAL AND TECHNOLOGICAL ASPECTS. Preprint, Tecnica de Higiene (Argentina), 20p., June 1968. 31 refs.

Air pollution is an increasing problem in the Argentina cities of Buenos Aires, Rosario, La Plata and Mar del Plata. Air pollution control measures are not keeping pace with the growth of industries, which are often located in neighborhoods of populated areas. The Municiple Director of Hygiene supervisors the problems of automotive emissions and industrial and domestic emissions. About one million vehicles travel daily in Buenos Aires. Traffic throughfares are being modified in order to eliminate congested traffic areas. The Director of Hygiene studies daily the chemical control of the pollutants of hydrocarbons, carbon monoxide and sedimented particles. The "Argentina Association for Air Contamination of sanitary education on all levels for the population.##

08816 **24**

Rose, Gerhard

WILL TRASH REMOVAL BE A MARKETING FACTOR FOR THE GLASS CONTAINER INDUSTRY AND PRODUCERS OF OTHER PACKAGING MATERIAL? ((Wird die Abfallbeseitigung zu einem Marktfaktor fur die Verpackungsglasindustrie und die Hersteller anderer Verpackungsmittel? Text in German. Glastech. Ber., 40(11):438-438, Nov. 1967.

While the removal of discarded glass containers presents a problem, it is not insurmountable, particularly if refuse crushing plants and techniques are developed which will refuse the silicon from waste glass. The substitution of plastic packaging materials for glass has the disadvantage that during incineration of polyvinyl-chloride-containing material, corrosive gases are evolved, which cause severe damage to the boiler units of the incinerator plant. Furthermore, the emission of hydrochloric and hydrofluoric acids from these plastics causes dangerous air pollution to such an extent, that in the United States the incineration of plastic waste is forbidden in the vicinity of large cities.##

16775 25

Russell, W. F.

AIR POLLUTION AND CHEMICAL INDUSTRY. Clean Air (J. Clean Air Soc. Australia New Zealand), 3(1):15-23, 25, March 1969. 17 refs.

Sources of air pollution from the chemical industry in New Zealand are discussed. Noxious or offensive gases, liquid droplets or fumes, smokes or particulate matter, and dust must be controlled. Methods available for dealing with waste gases are discussed and examples are given that demonstrate that improvements in plant efficiency have greatly reduced air pollution. Recovery systems, principally for SO2, are described. A brief summary is made of theoretical predictions for dispersion where other methods have failed.

08517 26

Saunders, R. A.

CHLORINATED HYDROCARBONS IN CLOSED-ENVIRONMENT ATMOSPHERES. In: A. L. Alexander and V. R. Piatt, The Present Status of Chemical Research in Atmosphere Purification and Control on Nuclear-Powered Submarines (Fifth Annual Progress Report), Naval Research Lab., Washington, D. C., NRL-6491, p. 8-11, Jan. 11, 1967. 6 refs.
CFSTI, DDC: AD 648505

Methyl chloroform and other low-toxicity chlorinated solvents have been used in closed submarine spaces in considerable quantity, with subsequent deleterious effect on equipment. Analysis of some commercial grades of methyl chloroform has shown the presence of appreciable quantities of other more toxic chlorinated hydrocarbons. The relatively high concentrations of these components may raise the toxicity of the commercial solvent mixtures above that of pure methyl chloroform. It is obvious that the use of technical grade solvents in closed atmospheres can add several unsuspected and perhaps undesirable contaminants to the atmosphere. Exposure of a crew to trichloroethylene, and the symptoms shown subsequent to decomposition of the trichloroethylene are described. Since methyl chloroform is known to decompose under certain conditions of passage through a submarine CO/H2 catalytic burner, with the formation of additional chlorinated hydrocarbons and corrosive hydrochloric acid, and since some of the chlorinated hydrocarbons so formed might possibly react to yield more toxic substances, the use of chlorinated hydrocarbon solvents should be prohibited in closed environmental atmospheres, where catalytic burners and alkaline materials form part of the air-purification system.

08583 27

Schiemann, G.

RESULTS OF EMISSION MEASUREMENTS FROM COMMUNITY INCINERATORS. ((Ergebnisse von Emissionsmessungen an Verbrennungsanlagen fuer Siedlungsabfaelle.)) Text in German. Brennstoff-Waerme-Kraft (Berlin) 19(9):440-443, Sept. 1968. 3 refs.

The dust and gas emissions of one large and 47 small and medium incinerator plants in Duesseldorf and Cologne were measured and compared. In 75% of the small and medium plants which employed various control methods the smoke plume was under the limiting value, while the dust discharge exceeded the standard. These results showed that poor dust control rather than the incineration itself was at fault. After varicus alterations, the small and medium plants were able to meet the dust emission stnadards. Dust emission in the smaller and medium plants before alterations was 4 kg./hr. for 2.5 t./hr. of refuse, while a large incinerator plant equipped with a roller grate and oil furnace, and electrostatic precipitators, showed only 3.2 kg./hr. dust emission for 20 t./hr. of refuse. The highest SO2 emission was 1.5 g./cu m, only traces fo SO3 were found, and the hydrochloric acid content of the stack gas was 0.1-1.1 g./cu m. It was concluded that whenever possible, the more economical and safer large incinerator plants should be constructed.##

00030 28

W. S. Smith

ATMOSPHERIC EMISSIONS FROM FUEL OIL COMBUSTION (AN INVENTORY GUIDE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-2.) Nov. 1962. 102p.

This review provides a guide for the inventorying and control of emissions arising from the combustion of fuel oil. Information was collected from the published literature and other sources. The report is limited to information on oil used as a source of heat or power (exclusive of process heaters). The data were abstracted, assembled, and converted to common units of expression to facilitate understanding. From these data, emission factors were established that can be applied to fuel oil combustion to determine the magnitude of air-contaminating emissions. Also discussed are the compositions of fuel oils; the preparation and combustion of fuel oil; and the rates of emission, their variables, and their control. (Author)##

17842 29

Stahl, Quade R.

PRELIMINARY AIR POLLUTION SURVEY OF HYDROCHLORIC ACID: A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., Contract PH 22-68-25, NAPCA Pub. APTD 69-36, 69p., Oct. 1969. 117 refs.
CFSTI: PB 188067

Prolonged exposure to low concentrations of hydrochloric acid can cause erosion of teeth, while severe exposures can result in pulmonary edema and laryngeal spasm. Recent data indicate that hydrochloric acid is also a stronger phytotoxicant than reported in earlier literature. The acid is strongly corrosive to most metals. In the United States, hydrochloric acid is produced as a by-product of the chlorination of organic compounds, processes involving the reaction of common salt with sulfuric acid, and the chlorine-hydrogen synthesis process. However, atmospheric emissions of the acid result from a large number of sources other than its manufacture and use. These include heating or burning of chloride-containing materials in the presence of organic compounds or other hydrogen-containing compounds. The high solubility of hydrogen chloride in water and the low vapor pressures of even 20% hydrochloric acid solution make collection of hydrogen chloride in water an effective and inexpensive method of control. Packed tower absorption systems are rapidly being replaced by cooled absorption systems consisting of either a countercurrent or co-current flow of gas and water. By the use of two or more towers in a series, emissions can be reduced to 0.1 to 0.3% by volume. Other systems effective for the control of hydrochloric acid or hydrogen chloride emissions are the rotary brush scrubber and the ejector venturi scrubber. Collection efficiencies for these systems can reach 99%.

30

09011

Wenzl, Herman F. J., and O. V. Ingruber

PRINCIPLES AND PRACTICES OF KRAFT BLACK LIQUOR EVAPORATION. Paper Trade J., Vol. 150, p. 51-56, Nov. 28, 1966. 16 refs.

The properties of black liquor are discussed in relationship to the multiple effect, thermal compression and Bergstrom-Trobeck evaporation processes. The problem of scaling during evaporation and the removal of such scales is also discussed.

ATMOSPHERIC INTERACTION

32

11479

Gusev, M. I. and R. S. Gil'denskiol'd, B. K. Baikov,
and E. V. Elfimova

DETERMINATIONS OF THE COMBINED EFFECT OF TOXIC SUBSTANCES IN PREDICTIONS OF ATMOSPHERIC POLLUTION. ((Ob uchete summarnogo deistviya tokischeskikh veshchestv pri prognozirovanii zagryazneniya vozdushmogc basseina.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):88-80, April-June 1968. ((17)) refs.
CFSTI: TT 68-50449/2

Several investigations of the combined effect of several pollutants present simultaneously in the atmosphere have been recently made. The results are listed. The data provide convincing proof that as a rule the combined effect of toxic substances in the atmosphere at the levels of liminal and subliminal concentrations are in accordance with the principle of simple summation. Data from many specialized institutes and organizations suggest that in most cases calculations of the expected atmospheric pollution are based on the maximum permissible concentrations established for individual pollutants, so that the results of mathematical determinations are compared only against such standards. There is a definite gap between theory and practice in the establishemnt of standards for atmospheric pollutants and the application of its recommendations. It is a matter of common knowledge that the implementation of the necessary hygienic measures at an operating enterprise is undoubtedly more complex and difficult than the prevention of marked air pollution at the planning stage. All these considerations point to the necessity for the planner to take account of the complex effects on man of any combination of industrial pollutants discharged into the atmosphere. The results of comprehensive investigations of the reflex effects produced by combinations of substances and the largely uniform findings of such investigations make it possible to recommend, with a high degree of reliability, that for practical predictive purposes the approved formula for calculations of combined effects should be extended to all combinations of substances present in discharges from a specific industrial enterprise or a complex of enterprises.##

32

04246

F. D. Krivoruchko

DETERMINATION OF AERIAL CONCENTRATION OF DECOMPOSITION AND OXIDATION PRODUCTS OF CERTAIN ORGANOALUMINUM COMPOUNDS (TEA, DEAC, TIBA, AND DIBAC). (Opredelenie produktov

razlozheniya i okisleniya v vozdukhe nekotorykh
alyuminiiorganicheskikh soedinenii (TEA, DEAKh, TIBA i DIB-
AKh.) Hyg. Sanit. 31, (8) 256-9, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

In connection with studies of working conditions in the manufacture of triethylaluminum (TEA), diethylaluminum chloride (DEAC), triisobutylaluminum (TIBA) and diisobutylaluminum chloride (DIBAC) it was necessary to determine health hazards in the factory air. Determination in air of substances formed by the decomposition and oxidation of TEA, DEAC, TIBA and DIBAC formed the purpose of the present work. Organoaluminum compounds in sealed glass ampules were used. Investigations were performed in 100 l chambers with a fan for uniform distribution of the decomposition products from organoalumimum compounds. The ampules with samples were broken with a special rod. The breaking of an ampule was followed by the formation of a white aerosol in the chamber (obviously, aluminum oxide) which persisted for 1.5-2.5 hr and then was slowly deposited on the chamber walls. Air samples were taken from the chamber at different time intervals (from 2 min to 3.5 hr). Aluminum oxide aerosols were sampled on an ashless filter paper of "Blue Band" grade in a Plexiglas cartridge. Samples for other toxic substances were taken by menas of absorbers, placing filter paper in front of the absorber in order to exclude aluminum oxide. Investigations showed that the processes liberated aluminum oxide aerosol, isobutylene, lower and higher alcohols, aldehydes, carbon monoxide and hydrogen. Moreover, the decomposition and oxidation of DIBAC yielded hydrochloric acid aerosols while the decomposition and oxidation of DEAC yielded ethyl chloride.##

MEASUREMENT METHODS

08139 33

Alekseyeva, M. V. and E. V. Elfimova

FRACTIONAL DETERMINATION OF HYDROCHLORIC ACID AEROSOL AND OF CHLORIDES IN ATMOSPHERIC AIR. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 31-33, May 1960.
CFSTI: TT 60-21475

A method for the determination of hydrochloric acid aerosol in the presence of chlorides has been developed. To accomplish this, hydrochloric acid was determined by micro-titration and chloride ions nephelometrically; chloride gas was then calculated from the two values. The determination of hydrochloric acid aerosol in the air is complicated by the presence in the air of other acid aerosols, sulfuric acid aerosol in particular. The procedure to avoid the loss of HCL in the presence of H2SO4 is presented also. The method was used in analyzing 37 samples of atmospheric air. Air samples were collected for 4 - 7 hours under different meteorological conditions. The results proved that aerosol of hydrochloric acid can be present in the air.##

11043 34

A. Alvarez

CONTINUOUS DETERMINATION OF TRACES OF SO2 IN AIR, USING WATER AS THE ABSORBING SOLUTION. Preprint, New York State Dept. of Health, Albany, Div. of Air Resources, ((24)) p., 1968. 3 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-69.)

A method for the continous determination of traces of SO2 in air, using water as the absorbing solution is presented. It is based on measurement of the color yield by the reaction between sulfur dioxide (as sulfate) and p-rosaniline hydrochloride-hydrochloric acid-formaldehyde mixture. The p-rosaniline methyl sulfonic acid produced in the reaction exhibited a maximum absorption at a wavelength of 560 millimicrons. The color was observed to be timperature independent within the range of 65 degrees F to 76 degrees F and stable for a period of our hours. Interferences from NO2 and NH3 were observed at levels beyond the concentrations existing in average urban air. The method described in this paper exhibited a higher degree of sensitivity than the standard West-Gaeke method when they were tested in parallel. (Author's abstract, modified)##

00125 35

R. L. Blanchard

RAPID DETERMINATION OF LEAD-210 AND POLONIUM-210 IN ENVIRONMENTAL SAMPLES BY DEPOSITION ON NICKEL. Anal. Chem. 38, (2) 189-92, Feb. 1966.

A procedure for determining Po-210 and Pb-210 simultaneously in environmental samples was developed by finding the optimum conditions for the spontaneous deposition of Po-210 and Bi-210 on nickel from an HCl solution. The effects of HCl concentration, hydrazine concentration, temperature, time of deposition, surface area of the planchet, and the presence of the HClO4 used to ensure oxidation of environmental samples were studied. Recoveries of Po-210, Bi-210 and Pb-210 were determined for various environmental samples spiked with a (Pb-210 Bi-210 Po-210) standard. The Po-210 concentrations were determined by alpha counting. The Pb-210 concentrations were determined by beta counting the Bi-210 daughter. An aluminum absorber was used to eliminate the Po-210 alpha and Pb-210 beta particles. (Author)##

21629 36

Buck, M.

DEVELOPMENT AND TESTING OF A FILTER CARTRIDGE FOR THE ELIMINATION OF DISTURBING INFLUENCES AT THE MEASUREMENT OF SULFUR DIOXIDE IN THE ATMOSPHERE. (Entwicklung und Pruefung einer Filterpatrone zur Ausschaltung von Stoereinflussen bei der Messung von Schwefeldioxid in der Atmosphaere). Schriftenreihe Landesanstalt Immissions- und Bodennutzungsschutz Landes Nordrhein-Westfalen (Essen), no. 6:28-30, 1966. 4 refs. Translated from German. Belov and Associates, Denver, Colo., 10p., April 15, 1970.

A filter cartridge based on the suction principle and consisting of a layer of quartz wool prepared with a solution of Ag2SO4 and KHSO4 was developed to absorb hydrogen sulfide, hydrogen chloride, and ammonia, the substances which interfere most with air quality measurements of sulfur dioxide. The cartridge absorbs the interfering compounds during sample intake almost completely at air throughputs of up to 180 liters an hour without also absorbing the SO2, and is therefore suitable for automatic SO2-measuring devices operating on low air throughput as well as for manual methods. Experiments are reported investigating in further detail the suction of H2S in the filter cartridge and SO2 uptake by the cartridge. When conventional sampling techniques are used for the Silikagel and TCM methods of manual SO2 measurements, SO2 values are not distorted by the filter. Instructions are given for its preparation and installation in the sampling device.

07689 37

Chaigneau, Marcel, and Monique Santarromana

DETERMINATION OF HYDROCHLORIC ACID IN THE PRESENCE OF SULFUR DIOXIDE WITH THE USE OF SOLID REAGENTS. ((Dosage de l'acide chlorhydrique en presence d'anhydride sulfureux a l'aide de reactifs solides.)) Text in French. Mikrochim. Acta (Vienna), No. 5-6, p. 976-987, 1965. 11 refs.

A method for the analysis of hydrochloric acid in the presence of sulfur dioxide is described. The phosphates of cadmium, zinc, mercury (II), and silver absorb gaseous hydrochloric acid in the presence of sulfur dioxide. Silver phosphate is especially recommended because of its easy precipitation in the pure state, its rapid reaction with a change of color and the accuracy of the determination of the resulting chloride. Tubing and lubricants for stopcocks should be chosen for their resistance to hydrochloric acid. It was also found that the method could be used to determine hydrobromic acid in the presence of sulfur dioxide.

11108 **39**

Coleman, Paul D. and Roberto Roldan

ELECTRICAL PROPERTIES OF MATERIALS IN THE FAR INFRARED REGION. (FINAL REPORT 1 FEBRUARY 1965 - 31 JANUARY 1967.) ILLINOIS UNIV. Urbana, Electro-physics Lab., Contract AF-AFOSR-272-65, Proj. 9767-02 AFOSR-68-0465, 8p., (22) refs.
CFSTI: AD 669573

A vacuum monochromator for the 80 to 1000 micron range, under construction for the past year, is described. Initial data on the rotational spectra HCl, HBr, N_2O, CH_3Cl and CH_3CN were taken to test the performance characteristics of the instrument. Performance data indicated that the monochromator characteristics are wavelength reproduction 0.1%; wavelength calibration 0.5%; relative intensity measurement 5 to 10%; and a resolution of 2% in the 300 to 700 micron range using a carbon bolometer detector and a scan time of 1 hour. (Authors' summary, modified)

02439 **38**

A. V. Demidov, L. A. Mokhov, and B. S. Levine (Tr.)

RAPID METHODS FOR THE DETERMINATION OF HARMFUL GASES AND VAPORS IN THE AIR. Vol. 10 of U.S.S.R. Literature on Air Pollution and Related occupational Diseases. Medgiz, Moscow, Russia. (Technical Transl. No. TT 66-11767.) 1962. pp. 114.

Volume 10 of the survey series "U.S.S.R. Literature on Air Pollution and Related Occupational Diseases" is a translation of A. V. Demidov's and L. A. Molhov's book "Rapid Methods for the Determination of Harmful Gases and Vapors in the Air" (Yekopehhlie Metoubi Oiipeuejiehnr B B Boeuyze Bpeuhlix N Iopooopaehlix Bewectb), published by Medgiz of Moscow in 1962. The greater part of the outlined procedures have been developed by U.S.S.R. analytical chemists, while some were taken from literature of other countries. The collection of tests appears to be intended primarily for the detection of dangerous gaseous and vaporous air pollutants in indoor working premises. For each harmful gas or vapor qualitative as well as closely approximate quantitative procedures are given to make possible the early determination of dangerous harmful gas and vapor concentration in the air of working premises and to forestall the occurrence of serious accidents. The volume was intended to meet the needs of smaller laboratories and of field industrial laboratory workers.##

00092 **40**

R. Drexler H. Barchas

CHEMO-ELECTRICAL SENSING DEVICE. Airkem, Inc., New York City, June 1961, 142p.
  CFSTI, DDC: AD 262502

This report describes an investigation of the feasibility of utilizing gas adsorption phenomena for the identification and quantitative determination of various gaseous materials. A discussion is presented of the factors influencing the performance of the various components of an experimental gas analyzer based on the measurement of characteristic adsorption energies. Reasons are given for the attempted use of this principle in such an instrument together with a theoretical discussion of the basis for concluding the instrument to be non-feasible in practice within the limitations of the original specifications. A review of material obtained from available literature sources as well as information resulting from experimental work is included in this report. (Author)**

08501 **41**

Heinz Engelhardt

AUTOMATIC ANALYZER FOR THE MEASUREMENT OF GASEOUS AIR POLLUTANTS. ((Automatische Analysatoren fur die Messung gasformiger Luftverunreinigungen)). Text in German. Z. Instrumentenk. (Brunswick), 85(6):188-196, 1968.

The three principles used for measuring both the emission of gaseous pollutants from a source and their "immission" are: (1) physical methods; (2) physical methods with the aid of chemical reactions; and (3) electrochemical methods. As a purely physical measuring method the photometric principle is employed in the ultraviolet, visible or infrared wavelengths. The disadvantage of this method is lack of sensitivity and it is therefore employed mainly for emission measurements, which are a thousand to ten thousand times larger than immission measurements. The second method, which depends first on a chemical color reaction with subsequent measurements with a photometer, is more sensitive. It will measure pollutants from 1 ppm down to 0.02 ppm. Ionization detectors with or without the aid of chemical reactions are also employed to a limited extent. Several photometers and ionization detectors are described and illustrated. The electrochemical methods are the most sensitive and selective. Numerous methods are available, but so far only the conductivity and galvanic methods have been employed for immission measurements. Several analyzers are described and illustrated. The preferred automatic method of analysis with a range of the smallest measurable concentrations for the most important air contamination gases is tabulated.

10518 **42**

Engelhardt, Heinz

A GAS ANALYZER FOR THE MEASUREMENT OF IMPURITIES IN AIR. Instr. Review, 15(190):98-99, Feb. 1968 Translated from German, Elektrotech. (W), No. 2, 1968.

A gas analyzer has been introduced which measures air impurities such as SO2, HCl, NH3, HF, NO2, CO, Cl2, and H2S. The instrument, called Picoflux, operates on an electroconductivity principle. The various air contaminants are analyzed by using different electrolyte solutions in the voltaic cell; if several gases are present, preliminary filtration is also employed. The instrument is suited for measuring low concentrations; 0 to 0.3 ppm SO2; 0 to 0.5 ppm HCl and 0 to 1 ppm NH3. The range is adjustable by a factor of 2.5 or 5 with the flick of a switch. An integrating recorder allows 10- or 3 minute mean measurement readings.

04257 43

F. Kh. Gol'dberg

PHOTOMETRIC DETERMINATION OF SMALL AMOUNTS OF VOLATILE MINERAL ACIDS (HYDROCHLORIC AND NITRIC) IN THE ATMOSPHERE.
(Fotometricheskoe opredelenie malykh kolichestv letuchikh mineral'nykh kislot (solyanoi i azotnoi) v atmosfernom vozdukhe.)
Gig. Sanit. 31, (8) 480-3, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/8-9

A spectrophotometric method was recommended for the analysis of low concentrations of mineral acids in the atmosphere. However, it is not always possible to use this method at the laboratories of the district sanitary-epidemiological centers because of the absence of a spectrophotometer. Modification of the spectrophotometric method for purposes of photometric determinations with a photoelectrocolorimeter required a calibration graph for the relationship between the optical density and the concentration of hydrogen ions in micrograms per 1 ml for an FEK-56 photoelectrocolorimeter. Standard solutions were prepared from fresh 0.005 N HCl and HNO3. Solutions were made containing 0.005 to 0.02 microgram/ml H+. A zero solution (distilled water) was prepared simultaneously. In all cases, an addition was made of 0.4 ml 0.01% alcohol solution of methyl red. The optical density of standard solutions and of a zero solution with the methyl red reagent was determined with respect to distilled water. This photometric technique made possible the establishment of constant optical densities of aqueous solutions of acids in the standard scale, independent of the pH of the distilled water used. The sensitivity of the photoelectrocolorimetric method and the sampling procedure are the same as for the spectrophotometric method. Studies were also made of the possibilities of visual colorimetric determinations. It was found that in the absence of a photoelectrocolorimeter the solutions can be determined colorimetrically by visual means by the method of standard series with an artificial scale.##

03369 44

S. Hantzsch and K. E. Prescher

ANALYZING AMINE TRACES IN ATMOSPHERIC AIR. STAUB (English Transl.) (Duesseldorf) 26, (8) 28-32, Aug. 1966.

A report on the concentration of primary aliphatic amines in air is given. Absorption tests on low concentration of amines in air were carried out in diluted hydrochloric acid, using wash bottles and impingers. Material losses during the concentration of absorption solutions were also evaluated. Practical experience in extracting primary aliphatic C1 to C6 amines with amylactic ester is reported. Reaction of primary amines with ninhydrine was used for photometric amine determination. (Author summary)##

45

15752

Hatterer, Andre and Michel Forissier

PSEUDOCHROMATOGRAPHIC MICROANALYSIS UTILIZING GAS-SOLID EQUILIBRIA. DETERMINATION OF NO_2, $NOCl$, Cl_2, HCl, CO_2 AND H_2O. (Microanalyse pseudochromatographique utilisant les equilibres gaz-solide. Dosage de NO_2, $NOCl$, Cl_2, HCl, CO_2, H_2O). Text in French. Z. Anal. Chem., vol. 247:266-271, Oct. 1969. 12 refs.

Gas separation was carried out in two stages, condensation and sublimation, in a small metal tube exposed to a temperature gradient from 77 to 300 K. A non-condensable gas such as helium, hydrogen or nitrogen was used as a carrier. In the first stage, the components of the mixture were selectively solidified in the cooled tube under partial pressures below those of the triple points. In the second stage, heating of the tube with an inverted temperature gradient caused sublimation and completes the separation. Catharometers or mass spectrometers were employed for the detection and determination of the gases. Gases could be determined in the range of 0.000001 to 0.0001 mole/ml of gas. (Author abstract modified)

46

03035

M. Hayashi, S. Konhi, and M. Sakabe

DETERMINATION OF MIST SIZE BY METAL COATED GLASS SLIDE. Bull. Nat. Inst. Indust. Health (Kawasaki, Japan) 6, 35-42, 1961

A new method for the determination of mist size and numbers of mist particles is described, which is useful in air pollution research as well as in industrial hygiene. A glass slide was coated with a very thin layer of metal film; iron was the best of three metals tried. The slides were placed in an Owens type dust counter or a cascade impactor for the collection of mist particles. Both acid and alkaline mists were tested. As the corrosive particles hit the slide, metal was dissolved and the transparent holes which were formed could be detected under an optical microscope. Methods for calculating true particle size from the holes in the metal-coated slide are given.##

47

10672

Hersch, Paul A.

CONTROLLED ADDITION OF EXPERIMENTAL POLLUTANTS TO AIR. Gould-National Batteries, Inc., Minneapolis, Minn., 24p., 1968. 21 refs.

(Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 1968, Paper 68-153.)

Experience with, and extensions of less known techniques of providing an air stream with a steady and adjustable level of a gaseous impurity are described. Leaving aside those means that employ moving solid parts, the paper discusses devices using liquid pistons, mikro-flow through channels, diffusion across channels and barriers, stream splitters for attenuation, and methods based on evaporation, electrolysis, chemical conversion, and irradiation. (Author s abstract, modified)

05078 48

E. R. Kuczynski

EFFECTS OF GASEOUS AIR POLLUTANTS ON THE RESPONSE OF THE THOMAS SO_2 AUTOMETER. Environ. Sci. Technol. 1, (1) 68-73, Jan. 1967.

A study was made of the quantitative response of the Thomas SO_2 autometer to gases that might coexist with SO_2 as air pollutants. These gases included NO_2, NO, HCl, CL_2, NH_3, and HF. The gas mixtures were prepared dynamically at the ppm level by a flow mixing method to a high degree of accuracy. Syringe pumps were used to add small quantities of pure gases to a large vol. air stream. The effects of NO_2, NO, and HF on the SO_2 reading were small, but HCl, NH_3, and CL_2 gave significant response. (Author abstract)##

06962 48

W. Leithe and G. Petschl

COMPARATIVE ABSORPTION TESTS FOR DETERMINATION OF GASEOUS AIR CONTAMINANTS IN WASH BOTTLES. (Vergleichende Absorption-sversuche zur Bestimmung gasformiger Luftverunreinigungen in Waschflaschen.) Z. Anal. Chem. 226 (4), 352-61 (1967). Ger.

Comparative gas-absorption tests are described using air contaminated with CO_2, HCl, NH_3, SO_2, and air samples from production plants containing fluorides. The concentrations were in the range of the Maximum Allowable Concentrations and below. Three kinds of gas washing bottles have been employed: 1) Impinger washing bottles, recently recommended for air analyses; 2) ordinary Drechsel washing bottles; 3) washing bottles with porous glass discs containing a foam formation agent. The effect of the Impinger equalled that of the Drechsel type. With HCl, NH_3, and SO_2 there was no difference between Impinger and foam absorption bottle, but with CO_2 and air samples containing fluorides foam absorption showed up to ten times higher absorption efficiencies. Corresponding analyses of open-air samples containing fluorides are being conducted. (Author summary)##

05587 S1

Linch, A. L., R. F. Stalzer, and D. T. Lefferts

METHYL AND ETHYL MERCURY COMPOUNDS--RECOVERY FROM AIR AND ANALYSIS. Am. Ind. Hyg. Assoc. J., 29(1):79-86, Jan.-Feb. 1968. 15 refs. (Presented at the 28th Annual Meeting, American Industrial Hygiene Association, Chicago, Ill., May 3, 1967.)

Attempts to recover dimethyl or diethyl mercury vapor by absorption in the reagents usually recommended for collection of mercury from air met with failure. The absorber design, whether impinger or porous glass diffusion type, contributed only minor differences. However, 0.1N iodine monochloride in 0.5N hydrochloric acid gave quantitative recoveries of dimethyl and diethyl mercury, monomethyl and monoethyl mercuric chlorides, and mercury vaporized into moving airstreams. The reagent also is applicable to the analysis of mercurial-bearing dusts. Again, the absorber design was not critical but impinger recoveries were rate-dependent. The Teflon permeation tube for SO2 calibration was adopted successfully to the dynamic calibration of microimpingers developed for personnel monitoring. The ACGIH procedure for analysis was followed after sample collection. (Authors' abstract)##

08455 S1

Ludwick, J. D.

IDENTIFICATION AND MEASUREMENT OF HYDROGEN CHLORIDE GAS IN THE ATMOSPHERE BY SPECTROPHOTOMETRIC AND RADIOMETRIC ANALYSIS. In: Pacific Northwest Laboratory Annual Report for 1966 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., Contract AT(45-1)-1830, BNWL481-1, p. 76-78, Oct. 1967. 1 ref.
CFSTI:

A simple method by which almost any field-collected chloride sample could be analyzed was developed. Standardized chloride solutions were treated with suitable volumes of silver nitrate solution tagged with Ag-110. The solution with the precipitated AgCl was analyzed for gamma. If a standard silver solution containing the proper specific activity of Ag-110 is used, there is no upper limit for chloride determination, and as little 2 x 10(to the minus 7 power) g can be rapidly measured. To sample hydrogen chloride gas from the atmosphere, a scrubber-column collector was designed and assembled. Two field tests using HCl gas were conducted over the Meteorology Grid network. About 5 pounds of HCl was released over a period of 10 minutes in each test. Twelve samplers were arranged downwind on the two innermost arcs located 200 and 800 meters from the source. A commercial portable HCl gas sampler was evaluated for analytical sensitivity. The instrument was moved along the meteorology arcs as HCl emission took place. The instrument was sufficiently sensitive to detect and measure the HCl at the 800 meter distance. Real-time measurements made with the portable instrument agreed with analytical results of chloride content from the field collectors by the radiometric technique described. The peak field concentration of HCl gas at 800 meters corresponded to an air concentration of about 2 x 10(to the minus 7 power) ppm.##

02570 **52**

M.D. Manita V.P. Melekhina

A SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF NITRIC AND HYDROCHLORIC ACIDS IN THE ATMOSPHERIC AIR IN THE PRESENCE OF NITRATES AND CHLORIDES. (Spektrofotometricheskii metod opredeleniya azotnoi i solyanoi kislot v prisutstivii nitratov v atmosfernom vozukhe.) Hyg. Sanit. 29, (3) 62-6, Mar. 1964.
CFSTI: TT65-50023/3

A spectrophotometric method for the determination of hydrochloric and nitric acids in the presence of nitrates and chlorides is described. This method is based on the determination of the optical density of colored aqueous solutions containing the above acids after the addition of methyl red in ethanol. The sensitivity of the method is 0.18 microgram of HcL per ml and 0.31 microgram of HNO_3 per ml. Other acids and bases interfere with the assay. CO_2 and SO_2 always present in atmospheric air do not interfere with the spectrophotometric determination of hydrochloric and nitric acids when this is carried out under the conditions described.##

19504 **53**

Mozan, C., A. Lacquaniti, and I. Pettinati

EVALUATION OF THE RISK PRESENTED BY INDUSTRIAL POISONS. (Evaluation du risque induit par les toxiques industriels). Text in French. Arch. Maladies Profess. Med. Trav. Securite Sociale, 31(3):141-146, March 1970.

The determination of the actual concentration of a pollutant in air leads to accurate, reproducible results only when certain factors that affect it are taken into account. Thus, as in processing a sample of polluted air, the pollutant must be absorbed completely by the absorbent used in its determination. It is essential to know that the bubbling rate of the air sample through the absorbent liquid has a significant effect on the amount of pollutant absorbed in the process. A potential source of incorrect interpretation of results of perhaps otherwise accurate measurements is the assumption of a uniform distribution of the pollutant throughout a given enclosed space while its actual distribution is nonuniform. These two findings and those to follow are illustrated by results of measurements of concentrations in air, in mg/cu m of hydrochloric and hydrocyanic acids, ammonia, sulfur dioxide, and trichlorethylene. Another important factor was discovered after a small hermetically sealed test room had been constructed for experiments in an atmosphere with known pollutant contents. Their measured actual contents in the test-room air were appreciably smaller then the theoretically expected ones. Analogeous results were obtained when air samplers were taken by small Draeger tubes and when the masonry walls of the test room were replaced by walls made of aluminum sheets. That some of the pollutant introduced into the air of the room is deposited on the walls was fully confirmed by a test in which an aluminum plate of known surface area was attached to the wall and the amount of pollutant deposited on it during the test was determined analytically. When 'flushed' with fresh air this amount progressively decreased, as expected. Such 'contaminated' walls may act as secondary sources of air pollution.

08324 54

Nietruch, F. and K. E. Prescher

DETERMINATION OF SULFUR DIOXIDE WITH PARAROSANILINE AND FORMALDEHYDE. ('Beitrag zur Bestimmung von Schwefeldioxid mit Pararosanilin und Formaldehyd.)) Text in German. Z. Anal. Chem. (Berlin), 226(3):259-266, 1967. 5 refs.

The comparative suitability of four commercially prepared and two isomerfree pararosaniline reagents for SO2 determination (West and Gaeke method) was studied. The absorption spectra of the pararosaniline reagents in neutral and hydrochloric solutions, and the spectra of the dyestuffs developed by formaldehyde, dichlorosulphitomercurate and hydrochloric pararosaniline solution were compared. In spite of differing behavior in hydrochloric solution, the pararosaniline reagents studied were deemed suitable for SO2 determination. A standard for pararosaniline reagents and sufficient dyestuff developing time are cited as factors important in the production of reproducible results.##

00492 55

F. E. Ordoveza and P. W. West

MICRODETERMINATION OF CAFFEINE USING THE RING OVEN TECHNIQUE. Anal. Chim. Acta Vol. 30:227-233, 1964.

A rapid and highly selective method for the microdetermination of caffeine of special interest for air pollution studies is presented. With the ring oven technique and with solutions of acetylacetone in sodium hydroxide and p-dimethylaminobenzaldehyde in hydrochloric acid, as little as 0.5 microgram caffeine on the ring can be determined with an average error of 3%. Compounds containing purine bases which would be likely to give the same color reaction as caffeine do not interfere. Of the organic air pollutants which might be collected from the atmosphere during the sampling for caffeine, benzo(alpha)pyrene and formic acid do not interfere. Interferences from formaldehyde and urea are easily eliminated. (Authors' summary)##

05896 56

J. J. Phair, R. J. Shephard, G. C. R. Carey, M. L. Thomson

THE ESTIMATION OF GASEOUS ACID IN DOMESTIC PREMISES. Brit. J. Ind. Med. (London) 15, 283-92 (Oct. 1958).

Measurements of the concentration of gaseous acids and other variables within the micro-environment of the home are reported A description is given of a small sequence sampler that gives six-hourly readings of gaseous acid concentration in domestic premises. Samples are returned to the laboratory for analysis by the conductivity method. Factors affecting the rate of sampling and evaporation of absorbent solution are critically evaluated. Evaporation is an important problem with the original model and methods of minimizing water loss habe been incorporated in later designs of the apparatus. Gaseous acid measurements largely reflect the amount of SO2 in a suburban atmosphere and an efficiency of 95% can be obtained with single-stage sampling. Ammonia and hydrochloric acid vapour are also absorbed although these are resent in lesser and approximately equal amounts. Sulphur trioxide is not absorbed to any significant extent, but this is a minor constituent of suburban atmospheres. The variation between different sampling units in the same room is considerable in the presence of dry gaseous SO3, and even under normal room conditions the 95% confidence limits of observations made from a single point are + or - 0.0024 p.p.m. Differences between different parts of a large building are even greater. Indoor measurements show a general tendency to follow outdoor readings with a lag of up to two hours; however, the indoor concentrations of gaseous acid are on the average much lower, and do not show the sharp peaks seen at outside locations. The relationship between gaseous acid levels in different parts of the city is not constant since in each area the industrial output is supplemented by a seasonally varying domestic heating load. The relationship between gaseous acid and particulate contaminants also varies in different parts of the town, perhaps on account of differing amounts of alkaline pollutants in the atmosphere. (Author summary modified)##

17128 57

Saltzman, Bernard E.

PREPARATION AND ANALYSIS OF CALIBRATED LOW CONCENTRATIONS OF SIXTEEN TOXIC GASES. Anal. Chem., 33(8):1100-1112, 1961. 20 refs.

The development and testing of analytical methods for the accurate determination of low concentrations of various toxic gases are described. All-glass flow systems were preferred for the dilution of gases with purified air, since such systems avoid serious errors from surface adsorption or reaction with impurities. Several practical flow dilution systems are described and diagrammed, as well as an asbestos plug flowmeter which was found useful for metering flows varying from a few hundredths of a milliliter to a few milliliters per minute; motor-driven glass syringes can also be used for metering gas (and liquid) flows in these ranges, but have the disadvantage of intermittent operation. Rotameters are convenient for metering gas flows greater than 10 ml/min, but becuase of calibration difficulties are considered secondary rather than primary measuring devices. In an evaluation of chemical analytical methods, it was found that many of the methods available were based on assumptions derived from studies conducted either at high gas concentrations or in liquid solutions; various difficulties are encountered when such methods are critically tested at low concentrations. The methods finally selected were first tested for sensitivity for samples of reasonable size; results consistent with both sample volume and test gas concentration; adequate absorption efficiency with the available sampling equipment; and adequate stability of reagents and final solutions. The role of sampling absorption efficiency is developed mathematically, and midget sampling equipment described. Finally, methods are given for each of the following gases: ammonia, arsine, bromine, carbon dioxide, carbon monoxide, chlorine, chlorine dioxide, ethylene oxide, hydrogen chloride, hydrogen cyanide, hydrogen fluoride, monoethanolamine, nitric oxide, nitrogen dioxide, phosgene, and stibine.

02559 **58**

B.E. Seleznev I.A. Chernichenko

SPECTROPHOTOMETRIC DETERMINATION OF THE CONCENTRATION OF CHLORTETRACYCLINE IN THE AIR. Opredelenie kormovogo khlortetatsiklina v atmosfernom vozdukhe spektrofotometricheskim metodom.) Hyg. Sanit. 31, (3) 346-8, Mar. 1966.
CFSTI: TT66-51160/1-3

The possibility of using spectrophotometry for the quantitative determination of chlortetracycline in the air was studied. Among the solvents investigated, the most suitable was 0.1 N, HC1 solution, since this produced the highest optical density in the ultraviolet. The method is fairly sensitive (0.01 micrograms/ml) but nonspecific, interference being encountered from other organic compurds which absorb similar wavelenghts.##

14486 **59**

Uhi, K.

THE DETERMINATION OF ACIDIC GASES IN WORKING ENVIRONMENTS BY ALKALI FILTER PAPER. (Alkali roshi ho ni yoru sagyo kankyo chu sansei gas no sokutei). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):49, April 1969.

The alkali filter paper method for determining acid gases in working environments entails soaking filter paper in a 30% potassium carbonate solution, drying the paper in air, and putting it in a vinyl holder having an exposure area of 64 sq cm. Absorbed gases are extracted with distilled water and determined qualitatively and quantitatively. The required exposure time is determined by the type of acid being measured, the production process, and the sensitivity of the determination method. Generally, 1 to 8 hrs are appropriate for acidic gases like SO2, HCl, and NO2, and 8 to 24 hrs for acid mists of sulfuric, phosphoric, and chromic acids. One hour is usually required for SO2 measurements by the para-rosaniline formaline method; the CL-Ba method requires 8 to 24 hrs. When the relationship between the amount of SO2 adsorbed on the filter paper and the average gas concentration in the working environment is plotted, a curve is obtained. Thus, on a per day basis, the coefficient of conversion depends on the amount adsorbed. However, the graph for an hour of exposure time is linear, suggesting that shorter exposure times would be convenient for the calculation.

06829 60

P. W. West and H. Coll

SPECTROPHOTOMETRIC DETERMINATION OF CHLORIDE IN AIR. Proc. Symp. Atmospheric Chemistry of Chlorine and Sulfur Compounds, Cincinnati, Ohio, 1957. (1959). pp. 37-41.

A spectrophotometric procedure for quantitation of chloride in air is described. Air is bubbled into a solution of iron perchlorate in perchloric acid. The light absorption of the iron-chloro complex is measured at 350 millimicrons and the estimate of concentration obtained from a chloride calibration curve. Experiments to determine efficiency, optimum concentration of reagents, and interfering elements are discussed. Method provides rapid, routine analysis of chloride, has a sensitivity higher than conventional procedures, and is not restricted by interferences.##

20030 61

Wyszynska, Halina, Konrad Kosinski, Stefan Maziarka, Zbigniew Misiakiewicz, and Artur Strusinski

METHODS OF STUDY OF ATMOSPHERIC AIR FROM THE HYGIENIC POINT OF VIEW. (Metody sanitarnego badania powietrza atmosferycznego). Text in Polish. Wydawnictwa Metodyczne Panstwowego Zakladu Higieny (Methodologic Study Govt. Dept. Hyg.). no. 10, 141p., 1968. 82 refs.

Methods of determining pollutants, the admissible concentration of which was limited by Polish legislation, and determining a number of other atmospheric pollutants which in excessive amounts are either hazardous to health or cause damage by corrosion are reviewed. Determination of air dustiness, chemical analysis of dust, and determination of sulfur dioxide, sulfur trioxide, carbon disulfide, nitrogen dioxide, nitric oxide, fluorine, chlorine, hydrogen chloride, ozone, phenol, benzene, chlorbenzene, and aniline are presented. A description of each method includes principles of the method, its limitations, a description of the apparatus, procedure of sample collection, and data evaluation. The apparatus required usually are not expensive and complicated, but they have to be precise and well calibrated because of the extremely low concentrations measured. The reagents used have to be of high purity. Most of the methods described were verified and tested on the laboratory scale and in routine determination of pollution. Thus no difficulty should be encountered in their application.

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CONTROL METHODS

04943 62

H. L. Barnebey

REMOVAL OF EXHAUST ODORS FROM SOLVENT EXTRACTION OPERATION BY ACTIVATED CHARCOAL ADSORPTION. J. Air Pollution Control Assoc. 15, (9) 422, Sept. 1965.

Isopropyl alcohol vapor is being exhausted in 2000 cfm of air at 120 deg F from a process involving the extraction of lemon pulp by the solvent. The emission also contains trace quantities of hydrochloric acid droplets and a varying amount of particulate matter from fruit skins and peelings. The emission caused a fire hazard and was credited with a contribution to the smog problem. The rate of emission of isopropyl alcohol was 35 gallons per hour. A liquid scrubber is used to remove the particulate matter and acid fumes. The scrubber uses a 1 N sodium carbonate solution. The scrubber is followed by the activated charcoal adsorption system. This consists of two horizontal absorbers containing beds of activated charcoal, a condenser, and the necessary storage tanks, piping, valves, and controls. The solvent is removed from the charcoal bed by steam stripping and is condensed along with part of the steam. This adsorption-desorption cycle can be repeated many times per day for a period of years until the charcoal bed becomes contaminated with high molecular weight substances. The condensed dilute alcohol is concentrated in a fractionating column so that it can be reused in the process. The odor, hydrochloric acid fumes, and particulate matter are reduced to the point that they are not readily detectable. The effluent air stream contains less than 0.05 lb per hour of isopropyl alcohol. The system continuously removes and returns for reuse in excess of 95 percent of the isopropyl alcohol vapor coming to the unit. The five percent loss of solvent does not represent exhaust to the atmosphere but is mainly caused by losses in collection and in the distillation of the dilute solvent. The total operating costs for the required electrical power, cooling water, steam, maintenance, chemicals, and supervision is about one-seventh of the market value for new alcohol.##

07552 63

Billings, Charles E., Charles Kurker, Jr., and Leslie Silverman

SIMULTANEOUS REMOVAL OF ACID GASES, MISTS, AND FUMES WITH MINERAL WOOL FILTERS. J. Air Pollution Control Assoc., 8(3):195-202, Nov. 1958. 20 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 26-29, 1958.)

Investigations have indicated that two in. thick filters at four lb/cu. ft. packing density will remove up to 80% of acid mist and up to 99% of acid gases and fumes. Total filter life depends upon concentration of contaminant in the entering air. A summary of filter performance is given. Estimated operating life based upon one use of the filter material can be obtained from the data given. With particulates such as iron oxide and fly ash, it has been found possible to wash and reuse filters about ten times. When iron oxide was collected simultaneously with SO2, filters were reused about eight times. Acid gas collection is significantly improved by the presence of moisture on slag wool filters. Mineral wool filters have several features such as, low cost (about 1 cents/lb.), small fiber diameter (4 micron and ability to withstand high temperatures (1000 deg F.). Slag wool will simultaneously remove sub-micron particulate materials with 90 to 99% efficiency. Resistance to flow through two in. slag wool filters (with an HF efficiency of 95%) is on the order of one or two in. of water, or if continuously moistened, at most 6 in. of water.##

10017 **64**

Bloomfield, Bernard D.

CONTROL OF GASEOUS POLLUTANTS. Heating, Piping, Air Condition ing, 40(1):195-206, Jan. 1968. 26 refs.

Control technology in relation to air pollution involves the application, singly or in combination, of tall stacks for dispersion process changes, and control equipment. Most gaseous contaminants can be controlled using the techniques of absorption, adsorption, direct flame combustion, and catalytic combustion. The theoretical principles of design and operation preclude under most circumstances the use of any of the shelf items for air pollution control purposes Good design, construction, and proper operation are the requisites of a satisfactory system. The special characteristics of a number o systems are described. A table of selected air quality standards is given for such pollutants as SOx, NOx, CO, H2S, and ozone.

17320 **65**

Kempner, Stanley K., E. N. Seiler, and Donald H. Bowman

PERFORMANCE OF COMMERCIALLY AVAILABLE EQUIPMENT IN SCRUBBING HYDROGEN CHLORIDE GAS. J. Air Pollution Control Assoc., 20(3): 139-143, March 1970.

Six commercial fume scrubbers were tested for their ability to remove hydrogen chloride gas from plating room exhaust air. The scrubbers, which represent different types of equipment available for this application, were chosen on the basis of their specified ability to remove 90% of the contaminant from a 2500 scfm gas stream consisting of ambient air with 20 mg/cu m of HCl gas. The units were connected to ductwork and piping simulating actual producting conditions. The contaminant was carefully metered into an accurately measured air stream drawn through the scrubber. A continuous sample of the scrubber discharge was recorded by a conductivity meter. The results are presented in a series of curves plotting efficiency vs water rate. Efficiencies of close to 100% were obtained with a vertical packed scrubber and extended surface scrubber. A horizontal packed scrubber and a plate scrubber attained efficiencies of better that 95%. A fan type scrubber was entirely unacceptable and is not recommended for use with a gaseous contaminant. The tests also revealed that optimum efficiencies can be obtained at water rates much lower than those recommended by the manufacturers. This makes it practical to use nonrecirculated water in production scrubbers. Variations in scrubber design and effectiveness of mist eliminators are also discussed. (Author abstract modified)

09057 66

Carter, C. Neal

EFFECTS OF pH AND OXIDIZING AGENTS ON THE RATE OF ABSORPTION OF HYDROGEN SULFIDE INTO AQUEOUS MEDIA. TAPPI, 50(7):329-334, July 1967. 19 refs.

The rates of absorption of hydrogen sulfide into aqueous solutions of hydrogen chloride, sodium hydroxide, and sodium hypochlorite were measured by means of a laminar liquid jet. The effects of various reactions were determined by analyzing the data in terms of the penetration theory. The various reactions that were found to influence the rates of absorption determined in this study were an ionization reaction, which had a first order forward rate constant of 8.4 per sec; a neutralization reaction between hydroxide ions and hydrogen sulfide molecules, which had an "infinitely high" rate; and an oxidizing reaction, which had an "apparent" first-order rate constant of 250 per sec for a 0.1N hypochlorite solution. The data on the absorption of hydrogen sulfide into basic solutions indicate the possibility that the laminar jet and wetted-wall column do not give comparable results for cases of absorption accompanied by an "infinitely fast" reaction. Further analysis of the rates of absorption into oxidizing solutions indicates that hydrogen sulfide will react initially with the hypochlorite ions to form dihydrogen sulfoxide, which in turn will form unstable complexes with more hydrogen sulfide molecules by sulfur-sulfur bonds. The data also indicate that for oxidizing solutions above pH 12, the rates of absorption are influenced by the decomposition of dihydrogen sulfoxide, which gives hydroxide ions as a product. (Author's abstract)##

09795 67

Chatfield, Harry E. and Ray M. Ingels

GAS ABSORPTION EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 210-232, 1967.
GPO: 806-614-30

Gas absorption equipment is designed to provide thorough contact between the gas and liquid solvent in order to permit interphase diffusion of the materials. This contact between gas and liquid can be accomplished by dispersing gas in liquid or vice versa. Absorbers that disperse liquid include packed towers, spray towers and venturi absorbers. Equipment that uses gas dispersion includes plate or tray towers and vessels with sparging equipment. The principles of designing plate towers and packed towers are discussed in detail. The following items are included in the discussion on packed towers: packing materials, liquid dispersion, tower capacity, tower diameter, number of transfer units, height of a transfer unit, and pressure drop through packing. An example of calculations involved in designing a packed tower for the removal of NH_3 is illustrated. Liquid flow, plate design and efficiency, flooding, liquid gradient on plate, plate spacing, tower diameter, and the number of theoretical plates are included in the discussion of plate towers with specific emphasis on bubble cap plates. An example of the calculations involved in determining the number of plates required and estimated diameter of a plate tower is illustrated. The choice of gas absorption equipment is usually between a packed tower and a plate tower. Both devices have advantages and disadvantages. Factors which the final selection should be based upon are listed. Spray-type absorbers and venturi absorbers are also briefly discussed. These towers are primarily used for removing particulates from gas streams, though they have some gas absorption applications. The gaseous air contaminants most commonly controlled by absorption include SO_2, NH_3, NO_x, and light hydrocarbons.

14369 68

Eberhardt, H. and W. Mayer

EXPERIENCES WITH REFUSE INCINERATORS IN EUROPE, PREVENTION OF AIR AND WATER POLLUTION, OPERATION OF REFUSE INCINERATION PLANTS COMBINED WITH STEAM BOILERS, DESIGN AND PLANNING. American Society of Mechanical Engineers, New York, Incinerator Div., Proc. Natl. Incinerator Conf., New York, 1968, p. 73-86. 7 refs. (May 5-8).

European steam generators with refuse firing must meet a number of stringent legal requirements for environmental control. In Germany, the dust emission of refuse incineration plants with a refuse throughput of more than 20 tons refuse/day may not exceed 150 mg dust/cu Nm clean gas referred to 7% CO_2 at any time. Depending on the preload of the site environment, this value must still be lowered so as to remain within the emission limits of 0.42 g/sq m/day for the annual mean and 0.65 g/sq m/day for the monthly mean. Flue dust collectors have over 98% efficiency. Difficult physical and chemical problems with the fuel and with boiler availability are met by attention to many engineering details. While the analysis of residential refuse is a relatively simple procedure, the determination of the volume and composition of industrial refuse is especially difficult and contributes in large part to the difficulties in planning and design of incineration plants. In Europe, refuse incinerators are combined with steam boilers, and operation of these large plants has shown that boilers with refuse fire chambers including the accessory equipment differ fundamentally from conventional plants in design and operation. The paper considers these plants in detail and compares them with plants operating with fossil fuels. It is shown that corrosion of boiler and superheater tubes is largely prevented by maintaining oxidizing conditions in critical areas. It was concluded that the primary factor in all considerations of the special requirements for refuse incineration plants, compared to conventional steam boilers, is the conversion of wastes into sterile end products.

69

16521

Tokyo Metropolitan Government, Japan, Public Nuisance Control Div.

THE EMISSION SOURCES OF HCL AND NH3 AND THEIR STANDARD CONTROL EQUIPMENTS. (Enka suiso oyobi ammonia no hasseigen to sono hyojun jogai shisetsu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):461-466, Aug. 15, 1966.

Hydrogen chloride is emitted by plants which produce pigments, dyes, industrial chemicals, medical supplies, and treat metal surfaces. Ten to 50 ppm HCl does not prohibit work, but is harmful to the teeth, nose, mucosa of the mouth, and face after long exposure. No one can work in air containing 50-100 ppm HCl. Ammonia is emitted by plants which produce pigments, manures, and medical supplies. Odor is noticed when the concentration reaches 100 ppm NH3. Chronic exposure to 400 ppm NH3 is harmful to the mucosa. Exposure to concentrations of 2500-6500 ppm NH3 for 30 minutes is dangerous, and exposure to concentrations of 5000-10,000 ppm NH3 quickly causes death. Hydrogen chloride and NH3 can be removed by absorption, adsorption, chemical reactions, and oxidation. Hydrogen chloride and NH3 dissolve easily in water which provides another suitable method for control. The water washing method is divided into a packed column, spray column, venturi scrubber and jet scrubber. The washing equipment consists of an air blower, a cleaning column, a pump, a water tank, and an exhaust pipe. The parts which come into contact with the gas must be constructed of an acid-alkali proof material. A mist catcher must be installed on top of the packed column. The hood must be carefully designed so the excess air is not inhaled. (Author abstract modified)

70

19220

Frman, James F.

DESULFURIZATION USING HYDROGEN CHLORIDE AND HYDROGEN. (Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,509,045. 4p., April 28, 1970. 5 refs. (Appl. July 11, 1968, 6 claims).

An improved method of desulfurizing hydrocarbon oils in the presence of hydrogen at a temperature between 600-950 F and partial pressure between 100-5000 psig and in the presence of hydrogen chloride at a partial pressure above 150 psig is described. Inert particles providing contact surface area for the reactants may be used but are not required. This process converts organic sulfur compounds contained in a heavy oil such as crude residuum to sulfur-free organic compounds and hydrogen sulfide. This process has advantages over catalytic hydrodesulfurization because this process does not require the presence of small catalyst compounds. Also, it is not necessary that the heavy oil be treated in the liquid state.

71

04279

S. T. Gadomski

DRY-PACKED BEDS FOR THE REMOVAL OF STRONG-ACID GASES FROM RECYCLED ATMOSPHERES. Naval Research Lab., Washington, D.C., Chemistry Division. (NRL Rept. No. 6399.) Aug. 30, 1966. 6 pp.
CFSTI, DDC: AD 642 274

Under certain conditions, strong-acid gases can be formed in recycled atmospheres by the combustion of halogenated hydrocarbons. One control measure involves the use of a dry absorbent filter. Li_2CO_3 has already been used as an absorbent in these filters as a result of a screening test of a number of scavenger materials. In this report the absorptive properties of some other potentially useful materials were examined. Baralyme and soda lime were superior to Li_2CO_3 in air at 76 deg F and over 50% R.H., while the silica-alumina catalyst with monoethanolamine (MEA) impregnant and the silica-magnesia catalyst were almost as effective as Li_2CO_3. However, Baralyme, soda lime, various basic materials (MEA, gaseous NH_3, Na_2CO_3, and quinoline) supported on the silica-alumina catalyst, and the silica-magnesia catalyst were all useless at 140 deg F. especially under dry conditions. Li_2CO_3, therefore, still remains as the most effective absorbent throughout the range of probable conditions. (Author abstract)##

00588 **72**

L.S. Harris

FUME SCRUBBING WITH THE EJECTOR VENTURI SYSTEM. Chem. Eng. Progr., 62(4):55-59, Apr. 1966.

The ejector venturi scrubber is a wet type of contractor which untilizes the velocity action of the contacting liquid media to both pump, scrub and/or absorb the entrained gas. This action is especially beneficial when handling highly corrosive or erosive gases. The unit has no moving mechanical parts in contact with the gas stream. In addition it eliminates the need for a costly corrosive or erosive resistant blower to pump the gas through the system. The device is basically comprised of a conventional venturi section and a spiral type spray nozzle which imparts a combination of axial and tangential velocities to the contacting liquid stream. The angle of the spiral and the size of the nozzle orifice are arranged to (1) impart sufficient tangential velocity to form a spray cone which fills the venturi throat area, (2) break up the motive liquid into the proper drop size to permit efficient scrubbing and/or absorption of the entrained gas and efficient separation of the liquid drops from the discharge gas, (3) impart the proper combination of axial and tangential velocity to obtain the desired pumping characteristics, and (4) impart sufficient tangential and axial velocity to the contacting liquid to provide the desired relative velocity between the contacting liquid and the entrained gas necessary for efficient scrubbing.##

15995 **73**

Herold, Paul and Georg Markus

RECOVERING HYDROGEN CHLORIDE AND SULPHUR DIOXIDE FROM GAS MIXTURES. (Assignee not given.) U. S. Pat. 2,301,779. 2p., Nov. 10, 1942. (Appl. Nov. 19, 1940, 3 claims).

A method of recovering hydrogen chloride and sulfur dioxide separately from gas mixtures is described. A gas mixture is washed with a medium liquid which consists of aromatic compounds containing oxygen in an ethereal linkage and of aromatic compounds containing oxygen in a phenolic linkage. Suitable compounds are xylenol and diphenyl ether. The gas mixture may either be passed through the liquid while it is stationary or led in a counter-current to the liquid flowing down, preferably in trickling towers charged with filter bodies. The hydrogen chloride leaves the washing liquid in a dry state free of sulfur dioxide. The washing liquid is easily regenerated by expelling the absorbed sulfur dioxide by heating, applying reduced pressure, or by subjecting it to both measures simultaneously. The washing liquid can be reused after cooling.

74

06778

(INDUSTRY AND ATMOSPHERIC POLLUTION IN GREAT BRITAIN.) Industrie et pollution atmospherique en Grande Bretagne. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris, France. (1967.) 6 pp. Fr. (Rept. No. CI 310.) (C.I.T.E.P.A. Document No. 24.)

A summary of the basis of governmental action in Great Britain in the struggle against industrial emissions is outlined. The regulations imposed by the "Alkali Act" are in most cases based on "the most practical means." Standards are given for chimney heights. Statutory limits are given for various materials emitted such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen sulfide, chlorine, arsenic, antimony, cadmium, and lead. The construction of tall buildings tends to reduce the benefits obtained by tall chimneys. A better knowledge of the effects of pollutants should be obtained so as not to burden industry with unnecessary expense in their control. It is urged that international standards for emission be adopted.##

75

00554

K.H. Knott S. Turkolmez

KRUPP ROTARY BRUSH SCRUBBER FOR THE CONTROL OF GAS, VAPOUR, MIST AND DUST EMISSIONS. Krupp Tech. Rev. (Essen), 24(1):25-28, April 1966.

The scrubber which has been used successfully for extraction and collection of particulates soluble in water was tested for effectiveness in removing gaseous pollutants from waste gases. The scrubber and the test procedures used are described in detail. Gases and particulates tested were sulfur dioxide, sulfur trioxide, hydrogen sulfide, methyl mercaptan, ammonia, ammonium chloride mist, pyridine vapor, pigment mixture and copper phthalocyanine dust. HCl and SO2 were absorbed sucessfully. The detention period used was too short for H2S, CH3SH, NH3 and pyridine. Wet collection of mists such as SO3 and NH4Cl is difficult. Good results were obtained with pigment particles.**

76

06063

P. Kotrappa and D. P. Bhanti

SMOKE PUFF GENERATOR ROOM AIR MOVEMENT STUDIES. Am. Ind. Hyg. Assoc. J. 28(2):171-174 (Apr. 1967).

A simple portable smoke generator to produce ammonium chloride smoke has been designed. Unit has been found to produce smoke of about 0.7 micron mass mean diameter with 1.12 geometric standard deviation. Further it has high obscuring power and long settling time suitable for studying room ventilation. Unit can be operated continuously over a period of three hours at 4.5 liters per minute before recharging. Generator is inexpensive, uses common chemicals and weighs only about 350 gm., when freshly charged.**

77

16501

Leone, P.

RECOVERY AND USE OF SULFUR DIOXIDE IN THE SULFUR EXTRACTION PROCESS. (Ricupero ed utilizzazione dell'anidride solforosa nel processo di estrazione dello zolfo). Text in Italian. Ann. Chim. (Rome), 21:238-244, 1931. 5 refs.

A procedure is proposed for converting sulfur-bearing gases into hydrochloric acid and chlorine gas by passing the sulfur dioxide over sodium chloride heated to 450-500 deg. The context of the proposal is directed toward the island of Sicily in the early 1930's, where the production of sulfuric acid from SO2 is considered unprofitable, and from where the cost of transporting such products as calcium sulfite and calcium bisulfite is considered prohibitive. Two chemical reactions are involved: sodium chloride, sulfur dioxide, water, and oxygen react to form sodium sulfate and hydrochloric acid; and sodium chloride, sulfur dioxide, and oxygen react to form sodium sulfate and chlorine gas. Both reactions are strongly exothermic. The HCl is to be used in dissolving limestone gangue; the Na2SO4, to enrich minerals with sulfur by way of increasing their sulfur yield; and Cl gas, in the manufacture of calcium chloride.

78

17814

Marchequet, Henri-Georges-Louis and Louis Gandon

PROCEDURE FOR EXTRACTING SULFUR DIOXIDE FROM GASES CONTAINING IT. (Procede d'etraction d'anhydride sulfureux a partir de gaz qui en renferment). Text in French. (Societe Nobel-Bozel, Paris (France)) French Pat. 1,224,892. 4p., June 28, 1960. (Appl. Feb. 2, 1959, 3 claims).

A gas mixture containing sulfur dioxide is brought in contact with a glyoxal solution at a temperature below 50 deg, in such a way as to retain the sulfur dioxide in the form of a glyoxal compound. The solution is then heated to a temperature above 50 deg, liberating the sulfur dioxide in the form of a nearly pure sulfurous gas. One may use an aqueous solution of glyoxal, containing 1-60% by weight of glyoxal; the optimum concentration is in the range of 10-30% and preferably 20%. The gas containing sulfur dioxide may also contain one or more of the following: air, hydrogen chloride gas, or hydrocarbons. The best operating temperature range for retaining the gas is 15-30 deg. The best regenerating temperature range is 65-75 deg. The regeneration process must be halted before the glyoxal is completely deprived of SO2.

04789 79

L. Mathys

A NEW SCRUBBER FOR THE CONTROL OF WASTE GASES FORMED DURING CHLORINIZATION OF ALUMINUM. Ein neuer Abscheider fur die bei der Aluminiumchlorierung entstehenden Abgase. Aluminum (Duesseldorf) 41, (11) 688-90, Nov. 1965. Ger.

The reaction products formed by the degassing process consist chiefly of gaseous aluminum chloride and a small amount of hydrogen chloride. At a temperature of 700-750 C, this gaseous mixture discharges from the smelter. If these exhaust gases enter the atmosphere without precautions, a white fog is formed when the aluminum chloride cools to approximately 180 C. This white fog consists of minute particles, and the hydrogen chloride combines with damp air to form hydrochloric acid fog. In the interest of keeping the air clean, it becomes necessary to control the exhaust from the chlorinization of aluminum. The techniques chosen transports the waste gases in concentrated form from the chlorinization apparatus to a scrubber where it is absorbed. By selecting a closed exhaust system, this can be accomplished. The scrubber installation described has been developed, and tested, for the aluminum industry.##

08162 80

Matsak, V. G.

THE PURIFICATION OF AIR POLLUTED BY VAPORS AND GASES. In: Survey of U. S. S. R. Literature from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, 177-185, May 1960.
CFSTI: TT 60-21475

Methods for the recovery and purification of noxious substances ejected by gas exhaust and ventilating installations are reviewed. It was found easier to purify exhaust gases than ventilating air. The methods include: Chemical purification method, Condensation method, Liquid absorption method, and Absorption by solid absorbents (adsorption). Present methods for air and gas purification can be rendered close to 100 percent free of most acid and alkali gases, organic solvent vapors and some other gases. But no effective and cheap method has been found up to the present for the recovery of carbon monoxide. Purification of air from solvent vapors, such as gasoline, acetone, acetates, etc. can be used effectively only in the case of tail gases and not in the purification of ventilating air, even though it is effective in both instances; the high cost makes its use for purification of ventilation air economically prohibitive. The possibility of using solid absorbents, such as activated charcoal and silicagel for the purification of ventilation air may apply to many cases. The primary obstacle lies in the high cost of adsorbent material and in the consumption of considerable electric energy in overcoming the pressure drop of recuperating installations.

81

18145

NEW GAS SCRUBBER REMOVES 0.1 MICRON DUST. Filtration Separation (Purley), 6(3):308, May-June 1969.

Peabody Ltd. has developed a high-efficiency scrubber which, when fitted with the new venturi agglomerating slot storage, removes gas, dust, and fume down to the 0.1-micron range. The scrubber recovers 99% of all particulate matter down to 1 micron with minimum pressure loss. It also provides a simple and effective means of gas absorption. Such contaminants as SO2, HCl, and Cl2 are readily removable.

82

15582

Palkot, Edward J., Jr. and C. Judson King

THE DESIGN OF AN IMPROVED DEVICE FOR ABSORPTION WITH CHEMICAL REACTION. California Univ., Berkeley, Lawrence Radiation Lab., AEC Contract W-7405-eng-48, 192p., June 1969. 75 refs.
CFSTI: UCRL-18918

When absorption is accompanied by chemical reaction in the liquid phase, the nature of the gas-liquid equilibrium data is often such that a high degree of gas purification may be accomplished in one or a very few equilibrium stages. Examples of such absorption systems that were considered are the scrubbing of carbon dioxide from gas streams using hot, catalyzed potassium carbonate and the scrubbing of hydrogen chloride from gas streams using water. The scrubbing of CO2 is important in the manufacture of high purity hydrogen for process uses such as the manufacture of ammonia, and HCl absorption is important in many processes, including a scheme for the reprocessing of enriched reactor fuels. Less commonly used devices for carrying out these absorption processes were considered which had features likely to result in high absorption rates and, consequently, high efficiency. The implementation of devices with these characteristics might be expected to result in considerable savings in investment and/or operating costs when compared to equipment currently used to effect the desired gas purifications. The devices considered were the co-current packed column, open pipe contractors with co-current flow of gas and liquid in the froth and annular regimes, and the spray tower. Based on information dealing with these devices in the literature and models which were proposed to fill gaps in the literature, device sizes necessary to scrub gases of quantities and compositions likely to be encountered in industry were calculated. Hierarchies of attractiveness of the devices for each of the systems studied were determined by assigning relevant cost variables to each contractor. It was shown that some of the devices could well be attractive in reducing the costs of absorption in the processes considered. (Author abstract modified)

83

05332

A. H. Phelps

WHAT DOESN'T GO UP MUST COME DOWN. Chem. Eng. Progr. 62 (10), 37-40 (Oct. 1966).

It has been the experience of the Procter and Gamble Engineering Division that air and water pollution control must be a combined effort. Attempts to control pollution in the one realm can easily generate a problem in the other. Several short examples of the combination of problems are presented. In one of the processes where HCl is evolved in small concentrations the quantities are enough to generate a major odor or corrosion problem in the immediate area. The quantities are too small to justify any recovery, so a simple, packed water scrubber was used. The exhaust to the atmosphere is pure, but the discharge out the bottom is an acid solution which to a user is a weak solution; however, from the viewpoint of the sewer, it is quite strong. The solution to avoid a water pollution problem in this case was to neutralize the effluent from the scrubber. A rock pit filled with coarse limestone is used, discharging from there to the sewer. Other caustic solutions could be used, but in these quantities, a truck load of rock a month is all that is needed to take care of the acid. A second example arises from control of particulates. When spray drying detergents, large volumes of hot air are exhausted which contain some fine dust particles from the spray drying operation. The concentration of particulate in this gas is around 3 gr./cu. ft. and represents an economically recoverable fraction. Therefore, cyclones are used to separate the particles dry so they may be recycled back to the process. The effluent from the cyclone contains about 0.3 gr./cu. ft of even finer particles. While this would meet the air pollution code for many communities it would certainly not meet the stricter laws being written now.##

84

16749

Rolfe, T. J. K.

REFUSE INCINERATION. B.C.U.R.A. (Brit Coal Util. Res. Assoc.) Gaz., 33(2):28-31, Feb. 1969. 12 refs.

Incinerable wastes cover a wide spectrum of gaseous, liquid, and solid materials. The problems posed by the need to dispose of increasing quantities of refuse by incineration have been discussed in a number of papers. This is a review of the incineration problem particularly as it relates to house refuse.

02541 85

(SCIENTIFIC METHODS AND TECHNIQUES TO DECREASE THE POLLUTION OF THE ENVIRONMENT, THROUGH INHALATION OR INGESTION, AND OF ACOUSTICAL "NUISANCES.") Moyens scientifiques et techniques de diminuer la pollution des milieux inhales ou ingeres et des "nuisances" acoustiques. (Chapter 3: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prevention et les problems scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la recherche scientifique et technique. June 1966. pp. 47-59.

The functioning of chlorophyll in the course of photosynthesis in leaves of plants serves as a method of air purification of sufficient importance to consider its use in control. Vegetation, like men and animals, can sustain a considerable amount of damage to the point where the threshold limit of absorption of toxic substances is exceeded. The three gases causing the most damage to vegetation are carbon monoxide, the sulfur oxides, and those containing fluorine. Also to be considered are acid "smog", toxic "smog", ozone, and nitrogen oxides. Other industrial pollutants which have a toxic influence, but less sever and localized, are dusts, hydrogen sulfides, hydrochloric acid, etc. Ethylene and carbon monoxide cause great damage to the growth hormones, particularly auxin. The effects of SO2, SO3, and H2SO4 are related to the quanity of gas emitted, the degree of resistance of the species, their state of development, and the various environmental conditions. The sensitivity of vegetation to the action of sulfur gases varies essentially as a function of the speed of absorption of the gas by the leaves. Through experimentation it has been found that the plant species which are most sensitive to SO2 are chickweed, alfalfa, barley, oats, wheat, rhubarb, lettuce, endive, spinich, cabbage, and tobacco. Apples, apricots, peaches, grapes, corn, and beans are less sensitive, whereas the floral species such as gladiolus, rose, and lilac offer considerable resistance. Aquatic vegetation is often used as purifying means for polluted streams. Subsoils purify themselves of pollutant materials in various ways, including uptake by vegetation and dispersion in the soil with rain water, etc. In a section on means of decreasing the inhaled pollutants the following are mentioned: dust collectors, normal methods of dispersion in the atmosphere, fumes from domestic fires, auto exhaust fumes, fuel additives, improvement of combustion in engines, recycling of crankcase gases, post-combustion appliances, and redesigning of motors. Also given in this section (Chapter 3) is some similar information on ingested pollutants and on problems of noise.##

10766 86

Seiler, Ed.

DESIGN FOR AIR POLLUTION CONTROL. SELECTING TOWER PACKING. Air Conditioning, Heating, Ventilating, 65(5):11, 13, 15, 17, May 1968.

Selection of scrubber packing is based on comparison of the following physical characteristics provided by the manufacturer from his calculations or tests: inertness of material to gas and scrubbing liqor, precentage of free space, specific surface, packed density, and bulk density. Performance characteristics which must also be considered include: low gas pressure drop, high liquid holdup, low liquid spread, and low height of one transfer unit. Various shapes of low coast, inert materials have been developed providing large surface areas, low resistance to gas flow and high absorption capacity. Among the various materials used to pack towers are metal carbon porcelain and plastic. The criterion for selection is the specific chemical reaction desired. Ring-shaped packing materials are common. One manufacturer uses sections cut from PVC pipe. Two types of packing are shown: Raschig rings, a basic type of packing material in which the rings are as high as they are round; and Pall rings, developed in Germany. With the advent of economical, inert plastic material, packing is now molded into many unusual shapes.

08344 87

Sheppard, Stanton V.

CONTROL OF NOXIOUS GASEOUS EMISSIONS. Proc. MECAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 21-28, Oct. 23, 1967. 3 refs.

Several new developments have taken place which have helped improve scrubber designs for controlling emission of noxious gases. Some major new technical developments have been: Greater use of the crossflow scrubber design principle, availability of light weight plastic tower packings, and wider acceptance of corrosion resistant glass reinforced polyester plastics. Some noxious gases commonly encountered are oxides of nitrogen, hydrogen chloride, hydrogen fluoride, silicon tetrafluoride, chlorine, chlorine dioxide, sulfur dioxide, hydrogen sulfide and mercaptans. In industrial applications, the removal of noxious gases from exhaust air streams is most often accomplished by bringing the air stream into contact with a liquid stream for a certain period of time. The amount of time required to transfer the noxious gas to the liquid is a function of several factors. These are: Gas rate, liquid rate, solubility of gas, mechanism of contact, and scrubber type. The packed scrubber is used most often today for controlling emission of noxious gases to the atmosphere. It is available in three basic operating designs: Counter current, cocurrent and crossflow. In the counter current packed design, the air stream containing the noxious gases is passed vertically upward in opposite direction to the flow of the down coming scrubbing liquid. The cocurrent packed scrubber allows the air stream and the scrubbing liquid stream to pass through the packed bed in the same direction. In the cross-flow scrubber the air stream moves horizontally through the packed bed while the scrubbing liquid moves vertically downward through the packed bed and perpendicular to the air streams. Three relatively new tower packing shapes are being used more frequently by engineers in designing scrubber equipment for removing gases. These packing materials are constructed of high density polyethylene or polypropylene. This gives them good resistance to corrosion and light weight compared to ceramic ring and saddle packing. Fiber reinforced plastics (commonly designated as FRP) are being used more and more to replace stainless steel, rubber and PVC lined steel and other metallic alloys for scrubber bodies. FRP is a material that uses a combination of polyester or epoxy thermosetting resins and glass fiber reinforcements to give a finished laminate that has excellent corrosion resistance, a high strength to weight ratio, and light weight.##

19386 88

Sherwood, T. K.

SOLUBILITIES OF SULFUR DIOXIDE AND AMMONIA IN WATER. Ind. Eng. Chem., vol. 17:245-247, July 1925. 21 refs.

In connection with studies of absorption, a literature search was conducted for available data on the equilibrium solubilities of the industrially important gases sulfur dioxide, ammonia, and hydrogen chloride. Of these, the data on the partial vapor pressures of sulfur dioxide and ammonia over their aqueous solutions are presented in plots and tables, and the references tabulated for each.

11058 89

W. Teske

IMPROVEMENTS IN THE PROCESSES AND OPERATION OF PLANTS IN THE CHEMICAL INDUSTRY LEADING TO REDUCED EMISSION. Staub (English translation), 28(3):25-33, March 1968.
CFSTI: TT 68-50448/3

The emissions from chemical plants can be reduced, in special cases, by changing the production process or, in general, by using a gas cleaning method. Change in the production process may be achieved by a basic alteration of the process itself, by changing the mode of operation, by modifying the equipment and by using a different raw material. For this purpose, the doublecontact method for sulphuric acid production, the pressure method for nitric acid recovery and the introduction of a covered carbide furnace are mentioned as examples. The superphosphate process, viscose process, production of betanaphthol, production of thermal phosphoric acid and production of calcium chloride are given as examples for waste gas cleaning. (Author's summary)##

18002 90

Tomany, James P.

A SYSTEM FOR CONTROL OF ALUMINUM CHLORIDE FUMES. J. Air Pollution Control Assoc., 19(6):420-423, June 1969.

During primary aluminum processing the molten aluminum is periodically fluxed with chlorine to separate impurities from the metal. The gaseous effluent from the chlorination process contains submicron particulates and gaseous vapors which produce a dense, white plume. The plume is acidic with hydrogen chloride and chlorine vapors, which cause a variety of corrosion problems.

Since the stack discharge temperature can range as low as 200 F -- and aluminum chloride sublimates at about 360 F, blockage of ductwork can also occur. For effective removal of both the particulates and chloride gases in the effluent, a sodium hydroxide solution is recommended. Since, such a scrubbing liquor produces a flocculent precipitate, a nonplugging type of scrubber is required. The solution UOP advanced was a "mobile packing" type of scrubber, utilizing a bed of polypropylene spheres in random, turbulent motion. The motion of the packing prevents plugging. The paper describes the design for such a system, describing the optimum use of ductwork, scrubber placement, gas saturation, and recirculation equipment. Instrumentation requirements, both minimum and optimum are discussed. A case study is detailed in which gases containing 5 gr/sef of particulates and 4 gr/sef of hydrochloric acid and chlorine vapors were passed through such a system. The cleaned effluent contained only 0.009 gr/sef of particulates and 0.002 gr/sef of vapors. (Author's Abstract)

02774 91

V.R. Volkening

PERFORMANCE OF COATING ON METAL IN AN INDUSTRIAL ATMOSPHERE. Preprint. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-86.)

The reason and methods of procedure for a protective coating testing program are discussed. Results based on fifteen years operation of such a program in a chemical plant on the Gulf Coast are described - some in detail. Atmospheric contaminants from high humidity and moisture condensation to chlorine and hydrochloric acid were encountered. A method for calibrating the atmosphere is outlined. Differences in the performance of several generic types of coating resins are presented. Generous references to the literature are included. (Author abstract)**

02562 92

A.I. Vulikh, Yu.A. Shivandronov, M.K. Zagorskaya, V.L. Bogatyrev

FILTERING GAS MASKS CONTAINING ION-EXCHANGE RESINS. (Fil'truyushchii ionitovyi protivogaz.) Hyg. Sanit. 31, (3) 813-6, Mar. 1966.
CFSTI: TT66-51160/1-3

The absorption by ion-exchange resins of the following gases mixed with air was tested for a wide range of concentrations and gas velocities: ammonia, amines (H-form of the cation-exchange resin KU-2), sulfur dioxide, chlorine hydrochloric acid (hydroxyl and carbonate forms of the anion-exchange resins AV-17 and EDE-10P).**

07549

N. Yamate

AIR POLLUTION BY TOXIC GAS AND ITS COUNTER MEASURE. Text in Japanese. Kuki Seijo (Clean Air, J. Japan Air Cleaning Assoc., Tokyo) 3(2):19-25, 1965. 5 refs.

The present status of air pollution in Japan and its counter measures are described according to the chemical composition of the pollutlants: sulfur oxides, nitrogen oxides, halogen compounds, organic compounds, and solid particles (dusts). The hourly variation of SO_2 concentration is graphed. In Tokyo, there is a peak around noon of about 15 pphm; NO_2 ranges from 1 to 1.5 pphm with little variation. Concentrations of SO_2, NO, NO_2, H_2S, and CO were measured in Yokkaichi, Osaka and Ube as well as in Tokyo. Graphs relating amount of traffic to CO concentration show almost the same pattern. Concentrations of HCl and HF in the air are quite small (0.35 ppm and 0.3-0.4 micrograms/cu m., respectively) near chemical plants producing these gases. Counter measures used against the various pollutant emissions are: the dry method, wet method, activated carbon method for sulfur oxides; alkali or oxidation method for nitrogen oxide; dry iron oxide and dry absorption methods for H_2S; and water washing method for HCl and HF. Afterburner methods by sparking and heat concentration are described for control of automobile exhausts. However, problems encountered with the afterburner methods are the high temperature required and nitrogen oxide increase. The equipment required is also rather large. Another method employing catalysts is described in which loam, molybdenum, white gold, nickel or vanadium are used effectively.##

EFFECTS - HUMAN HEALTH

03821 94

Back, K. C.

REVIEW OF AIR FORCE DATA FROM LONG TERM CONTINUOUS EXPOSURE AT AMBIENT PRESSURE. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 124-133, Nov. 1965.
CFSTI, DDC: AD 629622

Work which was performed under Air Force sponsorship in the area of environmental toxicology of space cabin atmospheres over the past 5 years is described. This work gave the warning that materials in trace quantities could prove toxic when presented to animals over long continuous exposure periods. Four exposure chambers were constructed for this work. This permitted use of one for a control group of animals and three for contaminant exposure chambers. All animals were followed by a number of clinical laboratory examinations before, during and following the 90-day exposure, and the animals were terminally given stress tests and then necropsied with both gross and microscopic examination of tissues. Carbon tetrachloride, while not causing death at 25 ppm, did cause serious clinical and microscopic liver changes in all animals exposed. The livers of the rats were so much involved that the pathologist made a diagnosis of "cirrhosis". Phenol caused absolutely no problems whatsoever at the 5 ppm level Hydrogen sulfide (20 ppm) did produce death in rats and mice, but none in monkeys. Methyl mercaptan (50 ppm) caused serious problems and death in 40% of the monkeys and 43% of the mice. Tests were conducted to find out whether animals could perform strenuous tasks following the 90-day exposure and to compare the long term, continuous toxicity of some propellants and propellant types in which the Air Force has an interest. Hydrazine, unsymmetrical dimethyl hydrazine, nitrogen dioxide and decaborane were tested as candidate materials. The results are discussed.##

06048 95

M. C. Battigelli, F. Hengstenberg, R. J. Mannella, and A. P. Thomas

MUCOCILIARY ACTIVITY. Arch. Environ. Health 12(4):460-466 (April 1966). (Presented at the 30th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 20-21, 1965.)

The mucociliary activity of respiratory epithelia, although well known over many years, has only quite recently assumed new importance, being recognized as one of the basic functions that the respiratory apparatus applies in responding to unfavorable environments. Physical, chemical, and biological "noxae" have been studied in their effects on the mucociliary activity of lower animals, mammals, and in man as well, with techniques that have proved accurate and reproducible. In this paper a brief review is given of these methods and of the results of investigations particularly related to the effects of air pollutants. Results of investigations on the effect of diluted diesel exhaust on the tracheal escalator of rats are summarized. An important finding is that exhaust dilutions that are without measurable effect on the respiratory resistance of human subjects are actually able to induce changes in tracheal clearance in some of the animals exposed for prolonged duration. With higher levels of exposure tracheal clearance of small mammals is affected with greater frequency. The removal of animals from the exposure invariably restores the original level of activity within a few days. The particulate content of the exhaust appears to play an important role in this type of respiratory injury. (Authors' summary)##

08749

96

CONCERNING THE QUESTION OF THE TOXICITY OF PLASTIC-LOW TEMPERATURE CARBONIZATION PRODUCTS. ((Zur Frage der Toxizitat von Kunststoff-Verschwelungsprodukten.)) Text in German. Arch. Hyg. Bakteriol. (Munich), 150(5):393-405, Sept. 1966. 20 refs.

The toxicity of the gaseous emission products from three different types of materials during low temperature carbonization was determined. The material was burned in a specially designed combustion chamber at 331 deg. C., 423 deg. C., and 468 deg. C. The addition of air in the low temperature tube was kept constant at 300 l./hr., but was varied in the mixing chamber at 0, 100, 200, and 300 l./hr. Five white rats were used for each 30-min. test, their behavior was closely observed, and blood tests and histological examinations were performed. The results of these tests are presented in three tables. During wood carbonization, carbon monoxide emission is the main danger, as determined by the COHb values of the rats. The toxic carbonization products from glass-reinforced polyester, which strongly irritated the lungs, will have to be determined by further chemical investigation; hydrochloric acid was the main irritant from the low temperature carbonization of polyvinyl chloride.

18027

97

Cornish, Herbert H. and Ellen L. Abar

TOXICITY OF PYROLYSIS PRODUCTS OF VINYL PLASTICS. Arch. Environ. Health, 19(1):15-21, July 1969. 12 refs.

Polyvinyl chloride polymers and formulations were pyrolyzed in a stream of air by gradually raising the temperature from ambient to approximately 600 C. The pyrolysis air stream was diluted with twice its volume of room air, and rats were exposed to it. Exposure to an air stream containing the pyrolyzed products of 1 to 2 gm of polyvinyl chloride polymer resulted in the death of 50 percent of the animals. Most deaths were due to carbon monoxide

(CO), and carboxyhemoglobin (COHb) levels correlated well with the amount of plastic pyrolyzed. Little histological evidence of lung damage was evident. When oxygen (O2) was added to the air stream to prevent deaths from CO, pulmonary edema and interstitial hemorrhage developed. The lungs of some animals exposed to high levels of pyrolysis products of vinyl chloride-vinyl acetate copolymer also showed focal edema and intra-alveolar hemorrhage. Polyvinyl chloride formulations, containing additives and inert materials, were in general less toxic per gram of sample pyrolyzed. (Author's Abstract)

98

11366

V.K. Efimova

THE HYGIENIC EFFECT OF AVERAGE TWENTY-FOUR HOUR ALLOWABLE CONCENTRATIONS OF CHLORINE AND HYDROCHLORIDE GASES SIMULTANEOUSLY PRESENT IN ATMOSPHERIC AIR. In: Maximum Permissible Concentrations of Atmospheric Pollutants, Book 8, V. A. Ryazanov and M. S. Gol'dberg (eds.), Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 15, pp. 82-85, 1968. ((16)) refs.
CFSTI: PB 179140

The health effects of simultaneously present chlorine and hydrochloride gases in atmospheric air was studied experimentally with guinea pigs. Chronic exposure of guinea pigs to the inhalation of air containing simultaneously chlorine gas in 0.1 mg/cu m concentrations had no substantial effect on the general condition, weight, blood composition, and bone marrow hemopoiesis of the experimental guinea pigs. No changes suggestive of induced pathology were found in the organs of any of the experimental guinea pigs belonging either to the control or experimental groups. It is recommended that the previously adopted limits of allowable 0.03 mg/cu m of chlorine gas and 0.015 mg/cu m of hydrochloride gas should be retained without any revision.##

99

05942

E. V. Elfimova

DATA FOR THE HYGIENIC EVALUATION OF HYDROCHLORIC ACID AEROSOL (HYDROCHLORIDE GAS) AS AN ATMOSPHERIC POLLUTANT. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Vol. 9. pp. 18-28. (1962). Russ. (Tr.)

It was shown that 0.1 mg/cu.m. is the concentration of threshold hydrochloric acid aerosol odor perception, that 0.05 mg/cu.m. is the odor non-perceptible concentration, that 0.6 mg/cu.m. is the concentration of threshold reflex effect on optical chronaxy, and 0.2 mg/cu.m. the concentration of threshold reflex effect on eye sensitivity to light. The concentration of threshold effect on digito-vascular tonicity is 0.5 mg/cu.m., and the threshold concentration of change in the rhythm and depth of respiratory movement is at 0.1 mg/cu.m. of the aerosol. On the basis of the above results it is recommended that 0.05 mg/cu.m. be accepted as the limit of allowable single concentration of hydrochloric acid aerosol in atmospheric air. Results of this investigation indicated that 10 mg/cu.m. of the aerosol, representing the limit of allowable concentration for working premises, elicited sharp shifts in the physiological reactions. The method used for the determination of hydrochloric acid aerosol in atmospheric air can be applied to the determination of the aerosol in the presence of H2SO4 aerosol and in the presence of free chlorine and chlorides. The present investigation indicated that atmospheric air in the vicinity of a magnesium plant is highly polluted with hydrochloric acid aerosol, that such air pollution extended over considerable distances from the magnesium plant, and that the sanitary protection zones around magnesium plant discharging hydrochloric acid aerosol, in the absence of gas purifying equipment, should be in excess of 3,000 m. Plans for future magnesium plants should mandatorily include provisions for the installation of hydrochloric acid absorbing equipment.##

07162 **100**

B. G. Ferris, Jr. and N. R. Frank

AIR POLLUTION AND DISEASE. Anesthesiology 25(4):470-478 Aug. 1964.

Atmospheric pollution can be classified under three headings: general, occupational and personal. The components are complex and variable so that it is difficult to extrapolate the prevalence of disease in one area to that of another unless the two have similar chemical compositions. Significant exposures can occur at work and may produce impairment of respiratory function. It is emphasized that tobacco smoking, and particularly cigarette smoking, is a most important factor in the causation of chronic nonspecific respiratory disease. Much research has been done to elucidate the mechanism whereby such changes are induced but specific answers concerning the mechanisms have not been forthcoming. Tables are included showing types of atmospheric pollution; comparison of Los Angeles and London types of pollution; categories of airborne materials with selected examples that may occur in industry and that may cause disease; age standardized rates of respiratory diseases by tobacco usage and sex; age standardized rates (%) of respiratory disease by current cigarette smoking habits and sex.##

11479 **101**

Gusev, M. I. and R. S. Gil'denskiol'd, B. K. Baikov,
and E. V. Elfimova

DETERMINATIONS OF THE COMBINED EFFECT OF TOXIC SUBSTANCES IN PREDICTIONS OF ATMOSPHERIC POLLUTION. ((Ob uchete summarnogo deistviya tokischeskikh veshchestv pri prognozirovanii zagryazneniya vozdushnogo basseina.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):88-80, April-June 1968. ((17)) refs.
CFSTI: TT 68-50449/2

Several investigations of the combined effect of several pollutants present simultaneously in the atmosphere have been recently made. The results are listed. The data provide convincing proof that as a rule the combined effect of toxic substances in the atmosphere at the levels of liminal and subliminal concentrations are in accordance with the principle of simple summation. Data from many specialized institutes and organizations suggest that in most cases calculations of the expected atmospheric pollution are based on the maximum permissible concentrations established for individual pollutants, so that the results of mathematical determinations are compared only against such standards. There is a definite gap between theory and practice in the establishemnt of standards for atmospheric pollutants and the application of its recommendations. It is a matter of common knowledge that the implementation of the necessary hygienic measures at an operating enterprise is undoubtedly more complex and difficult than the prevention of marked air pollution at the planning stage. All these considerations point to the necessity for the planner to take account of the complex effects on man of any combination of industrial pollutants discharged into the atmosphere. The results of comprehensive investigations of the reflex effects produced by combinations of substances and the largely uniform findings of such investigations make it possible to recommend, with a high degree of reliability, that for practical predictive purposes the approved formula for calculations of combined effects should be extended to all combinations of substances present in discharges from a specific industrial enterprise or a complex of enterprises.##

102

01741

E. Mastromatteo

HEALTH ASPECTS IN FIRE FIGHTING (PART 1). Firemen 33, (6) 20-1, Aug. 1966.

In the course of their work, fire fighters are exposed to a variety of toxic fire gases and other adverse health factors. Quite often they are required to enter buildings, confined spaces, and other places where they may be exposed to extremes of heat, to smoke, to oxygen lack, and to toxic gases created by the combustion process. The physical exertion, excitement and anxiety involved in many fire situations add to the health problems by increasing the breathing and heart rates. Fire fighting therefore can place severe demands on the respiratory, cardio-vascular and nervous systems. Some of the chief health hazards encountered in fire fighting are discussed. Reference is also made to a special study of heart and lung disease in fire fighters. (Author summary)##

103

11378

Melekhina, V. P.

THE PROBLEM OF COMBINED ACTION OF THREE MINERAL ACIDS. In: Biological Effect and Hygienic Significance of Atmospheric Pollutants, Book 1/9, V. A. Ryazanov and M. S. Gol'dberg (eds.), Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 16, pp. 76-81, 1968. ((6)) refs.
CFSTI: PB 179141

convincing proof that as a rule the combined effect of toxic substances in the atmosphere at the levels of liminal and subliminal concentrations are in accordance with the principle of simple summation. Data from many specialized institutes and organizations suggest that in most cases calculations of the expected atmospheric pollution are based on the maximum permissible concentrations established for individual pollutants, so that the results of mathematical determinations are compared only against such standards. There is a definite gap between theory and practice in the establishemnt of standards for atmospheric pollutants and the application of its recommendations. It is a matter of common knowledge that the implementation of the necessary hygienic measures at an operating enterprise is undoubtedly more complex and difficult than the prevention of marked air pollution at the planning stage. All these considerations point to the necessity for the planner to take account of the complex effects on man of any combination of industrial pollutants discharged into the atmosphere. The results of comprehensive investigations of the reflex effects produced by combinations of substances and the largely uniform findings of such investigations make it possible to recommend, with a high degree of reliability, that for practical predictive purposes the approved formula for calculations of combined effects should be extended to all combinations of substances present in discharges from a specific industrial enterprise or a complex of enterprises.##

01741 102

E. Mastromatteo

HEALTH ASPECTS IN FIRE FIGHTING (PART 1). Firemen 33, (6) 20-1, Aug. 1966.

In the course of their work, fire fighters are exposed to a variety of toxic fire gases and other adverse health factors. Quite often they are required to enter buildings, confined spaces, and other places where they may be exposed to extremes of heat, to smoke, to oxygen lack, and to toxic gases created by the combustion process. The physical exertion, excitement and anxiety involved in many fire situations add to the health problems by increasing the breathing and heart rates. Fire fighting therefore can place severe demands on the respiratory, cardio-vascular and nervous systems. Some of the chief health hazards encountered in fire fighting are discussed. Reference is also made to a special study of heart and lung disease in fire fighters. (Author summary)##

11378 103

Melekhina, V. P.

THE PROBLEM OF COMBINED ACTION OF THREE MINERAL ACIDS. In: Biological Effect and Hygienic Significance of Atmospheric Pollutants, Book 1/9, V. A. Ryazanov and M. S. Gol'dberg (eds.), Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 16, pp. 76-81, 1968. ((6)) refs.
CFSTI: PB 179141

considerations must be main criterion in deciding permissible concentrations, which constitute the "hygienic" standards ultimately to be achieved. Economic and technological reasons may dictate temporary "sanitary" standards, which modify the requirements for a limited period. "Technological" standards relate to the economic and technological consequences of air pollution and do not concern health. The maximum permissible concentrations of toxic substances used in toxicology and industrial hygiene are not sufficiently stringent for general use, and control standards are therefore based on the results of tests carried out on animals and human subjects. Tests on animals show that certain concentrations of toxic substances cause functional changes (e.g., in higher nervous activity, cholinesterase activity, and excretion of coproporphyrin) as well as a number of protective adaptational reactions. The results are used to establish maximum permissible concentrations of pollutants within a 24-hour period. Tests on human volunteers provide a basis for determining the maximum average concentrations at a given time. Reactions to odorous substances give the olfactory threshold and the level of concentration causing respiratory and visual reflexes, as well as subsensory effects such as changes in light sensitivity and in the activity of the cerebral cortex. Morbidity statistics also provide evidence of harmful pollution, but cannot serve as a basis for establishing maximum permissible concentrations, which should aim not only at preventing illness but also at avoiding pathological and adaptational reactions. (Author abstract)##

04932 106

R. P. Smith, R. E. Gosselin, J. A. Henderson, and D. M. Anderson

COMPARISON OF THE ADSORPTIVE PROPERTIES OF ACTIVATED CHARCOAL AND ALASKAN MONTMORILLONITE FOR SOME COMMON POISONS. Toxicol. Appl. Pharmacol. 10, (1) 95-104, Jan. 1967. (Presented in part at the Ninth Annual Meeting, American Association of Poison Control Centers, Chicago, Ill., Oct. 24, 1966.)

Activated charcoal and our own preparation of Alaskan montmorillonite have been compared in vitro with respect to their adsorption isotherms at 37 degrees for six common poisons. When evaluated on the basis of the maximum adsorption capacity and dissociation constant in 0.1 N HCl ("artificial gastric juice"), montmorillonite absorbs d-amphetamine, tripelennamine, ferrous sulfate, and ethyl alcohol about as well as activated charcoal. With substances which are not ionized at the pH of gastric juice, notably salicylic acid and pentobarbital, a 100-fold difference in dissociation constants and a 3- to 13-fold difference in absorption capacities occur in favor of charcoal. Both absorbents are expected to dissociate free salicylate if allowed to pass into the intestinal tract. When the pH rises from 1 to 7.4, the dissociation constant of the salicylate-charcoal complex increases 5-fold and the capacity decreases 3-fold. Over the same pH range, however, the montmorillonite-salicylate complex increases its dissociation constant more than 10-fold and decreases its capacity more than 50-fold. Despite its less acceptable appearance, activated charcoal is judged to be superior to montmorillonite as a gastrointestinal adsorbent for general clinical use in acute poisonings. (Author summary)##

05946 107

Stayzhkin, V. M.

HYGIENIC DETERMINATION OF LIMITS OF ALLOWABLE CONCENTRATIONS OF CHLORINE AND HYDROCHLORIDE GASES SIMULATENOUSLY PRESENT IN ATMOSPHERIC AIR. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 55-61. (1962). Russ. (Tr.)

This study was confined to the use of low concentrations of chlorine and hydrochloride gases and their effect on the physiological reactivity of man. The methods of investigation were: determination of threshold odor perception, optical chronaxy and adaptometry. Results of this investigation indicated that 0.75 mg/cu m was the concentration of threshold chlorine odor perception, and 0.02 mg/cu m the concentration of threshold hydrochloride gas odor perception. The simultaneous presence in the air of chlorine and hydrochloride gases was not odor perceptible when the gases co-existed in the following ratio concentrations: 0.3 mg/cu m of chlorine and 0.1 mg/cu m of hydrochloride gas, also 0.2 mg/cu m of chlorine and 0.13 mg/cu m hydrochloride gas. The additive physiological and neurological effects of simultaneously present chlorine and hydrochloric gases in the air were in the nature of arithmetical summation. Optical chronaxy tests indicated that threshold reflex effects were produced by chlorine and hydrochloride gas simultaneously present in the air in the following ratio combinations: chlorine, 0.3 mg/cu m and hydrochloride gas, 0.3 mg/cu m and also chlorine, 0.3 mg/cu m and hydrochloride gas, 0.3 mg/cu m. Tests of eye sensitivity to light indicated that the combination of 0.2 mg/cu m of chlorine and 0.1 mg/cu m of hydrochlorinde gas constituted a threshold combination mixture of the 2 gases which elicited changes in eye sensitivity to light. The present investigation also indicated that the previously adopted limits of allowable single chlorine concentration of 0.1 mg/cu m and of hydrochloride gas of 0.005 mg/cu m simultaneously present in atmospheric air were below the threshold of odor perception and of effect on reflex activity.

21078 108

Styazhkin, V. M.

EXPERIMENTAL BASIS FOR THE DETERMINATION OF ALLOWABLE CONCENTRATIONS OF CHLORINE AND HCL GAS SIMULTANEOUSLY PRESENT IN ATMOSPHERIC AIR. U.S.S.R. literature on Air Pollution and Related Occupational Diseases, vol. 8:158-164, 1963. (B. S. Levine, ed.)
CFSTI: 63-11570

An experimental basis for the determination of allowable concentrations for simultaneously present chlorine and HCl gas in the ambient air was obtained. Studies were conducted in the vicinity of a magnesium plant at 300, 500, 800, 1000, 2000, and 3000 m from the plant. Air samples were collected by the aspiration method through an absorber equipped with a porous plate No. 1. One absorber was filled with double distilled water; the other was filled with an acidified solution of methyl orange. Air samples collected through double distilled water were used for the determination of HCl aerosol by the titration method. Sulfuric acid, which interferred with analysis, was determined nephelometrically and subtracted from the titration result. Chlorine was determined colorimetrically in the sample. Results showed that chlorine and HCl gas concentrations were considerably in excess of the allowable maximal single concentration limit at all collecting points. The threshold of Cl odor preception was 0.7 mg/cu m and of HCl gas, 0.2 mg/cu m. Threshold odor perceptions of Cl and HCl gas simultaneously present in the air were established in the following combinations: 0.3 mg/cu m Cl, 0.1 mg/cu m and 0.2 mg/cu m Cl, 0.13 mg/cu m HCl. Results of the tests by the optical chronaxy method established the threshold of reflex effect of Cl and HCl gas simultaneously present in the air in the following concentration: 0.3 mg/cu m Cl, 0.2 mg/cu m HCl and 0.2 mg/cu m Cl, 0.3 mg/cu m HCl. The limit of maximal single concentration for Cl was 0.1 mg/cu m and for HCl, 0.05 mg/cu m. The simultaneous presence of Cl and HCl gas in the air in corresponding concentrations had no effect on the control curve of dark adaptation. Results showed that the concentrations were below the threshold of odor perception and reflex effect and below the allowable concentration limit.

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EFFECTS - PLANTS AND LIVESTOCK

09275 **100**

Bohne, Helmut

IMMISSION DAMAGE CAUSED BY HOSPITAL WASTE INCINERATION. STAUB (English translation), 27(10):28-31, Oct. 1967. 4 refs.
CFSTI: TT 67-51408/10

The strong decolorization and whitening of plants observed in two gardening nurseries were caused by hydrogen chloride. In both cases the sources of emission were refuse incineration plants of hospitals in which chlorine compounds in the refuse, consisting 80-90 percent of paper and packaging material, were decomposed during short periods at a temperature of 800 - 1,000 deg C. Erection of chlorine washing plants appears, therefore, to be necessary. (Author's summary)##

06326 **110**

W. W. Heck, L. S. Bird, M. E. Bloodworth, W. J. Clark, D. R. Darling, and M. B. Porter

ENVIRONMENTAL POLLUTION BY MISSILE PROPELLANTS. Texas Agricultural and Mechanical Research Foundation, College Station. Apr. 1962, 120 pp. (Rept. MRL-TDR-62-38.)
CFSTI, DDC: AD 282984

The effects of 21 missile fuel components on aquatic organisms, soil microflora, plants and soils were determined. Goldfish and Daphnia were subjected to 0,1,10,100 and 1000 ppm of the test compounds for 72 hours in the aquatic studies. Some or all of 10 goldfish and 13 Daphnia died, when exposed to 100 ppm of the test chemicals. Counts of bacteria, actinomycetes, and fungi in the soil microflora studies showed no significant decrease in any of the organisms with a 100 ppm application of test chemical to the soil samples. Three of the chemicals may sterilize the soil of actinomycetes. Plant studies were threefold using squash, soybean, cotton, cowpea and corn; germination studies using 1000 ppm of each test chemical produced consistent inhibition of germination by two of the compounds and two ionic species; seedling studies using a soil drench of each test chemical at 100 ppm, produced toxic symptoms with three of the ionic components; seedling studies using three test chemicals (gases) at 100 ppm as air pollutants produced severe injury to death of all species with each of the test gases. Soil studies (1000 ppm) included the leachability and runoff potential of each test chemical as well as the effects on soil. (Author abstract)##

21691 **111**

Heck, Walter H., Robert H. Daines, and Ibrahim J. Hindawi

OTHER PHYTOTOXIC POLLUTANTS. In: Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas. Jay S. Jacobson and A. Clyde Hill (eds.), Pittsburgh, Pa., Air Pollution Control Assoc., 1970, p. F1-F24. 54 refs.

The effects of several phytotoxic pollutants are considered. Ethylene acts as a growth hormone; it causes a reduction in growth, stimulates lateral growth, and decreased apical dominance. Plant leaves may develop epinasty or show chlorosis, necrosis, or abscission. Injury from oxidants other than ozone, PAN, or nitrogen dioxide may be chronic or acute. These oxidants, none of which have been identified, may cause necrosis, collapse of leaf tissue, and dehydrated and bleached lesions. Cotton leaves affected by herbicides show a yellow-green mottling or stippling and vein clearing may be pronounced. Tomatoes may show epinasty and twisting of plant parts. Arsenic trioxide injury on sensitive fruit and vegetable crops produces necrotic spots on the leaves, petioles, twigs, and fruits. Mild to severe interveinal necrosis and chlorosis may occur on broad-leaved plants as a result of atrazine. Necrosis, chlorosis, and epinasty are the common symptoms of chlorine injury. Acute tissue collapse and necrotic spotting have resulted from ammonia injury. Discoloration of peach and apple fruits have also been reported. Hydrogen chloride caused an acid-type necrosis. Tipburn to fir needles and necrosis along leaf margins have also been noted after HCl exposures. Mercury causes chlorosis, abscission of older leaves, growth reduction, and general poor growth and development. The effects of particulates, hydrogen sulfide, and carbon monoxide are briefly discussed.

12195 **112**

Mukammal, E. I., C. S. Brandt, R. Neuwirth, D. H. Pack, and W. C. Swinbank

AIR POLLUTANTS, METEOROLOGY, AND PLANT INJURY. World Meteorological Organization, Geneva, Switzerland, Commission for Argicultural Meteorology, WMO-TN 96, WMO-No. 234.TP.127, 73p., 1968. 177 refs.

The problem of air pollution injury to agriculture and the present state of knowledge is reviewed in order to assist meteorologists and others concerned in seeking means of preventing or controlling the extent of injury. The source of various contaminants and their chemical reactions in a contaminated atmosphere are examined in detail. The variations in the susceptibility of plants to air pollution damage as related to meteorological and other factors in the plant environment are described. These factors, many of which exert their influence through their effect of stomatal movement, include light, nutrition, exposure, relative humidity, and temperature. The recognizable symptoms of air pollution injury are discussed and suggested for indentifying the causative agent and recognizing similar symptoms produced by other disorders are given. A section on air pollution meteorology states that knowledge of the atmosphere's ability to transport and dilute contaminants cannot be applied to air pollution problems without concurrent consideration of pollutant emissions and the biological sensitivity and response characteristics of certain plants. The effects of surface configuration on diffusion, to vertical and horizontal turbulent diffusion, atmospheric transport, research problems, and meteorological applications to air pollution problems are discussed. Present and possible future programs in the prediction of pollutant concentration, air pollution potential, and pollution damage are reviewed; the general principles involved in collecting and analyzing air samples to determine the nature and concentrations of pollutants are outlined. Control measures and the present situation are also discussed. (Author summary modified)

113

02541

(SCIENTIFIC METHODS AND TECHNIQUES TO DECREASE THE POLLUTION OF THE ENVIRONMENT, THROUGH INHALATION OR INGESTION, AND OF ACOUSTICAL "NUISANCES.") Moyens scientifiques et techniques de diminuer la pollution des milieux inhales ou ingeres et des "nuisances" acoustiques. (Chapter 3: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prevention et les problems scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la recherche scientifique et technique. June 1966. pp. 47-59.

The functioning of chlorophyll in the course of photosynthesis in leaves of plants serves as a method of air purification of sufficient importance to consider its use in control. Vegetation, like men and animals, can sustain a considerable amount of damage to the point where the threshold limit of absorption of toxic substances is exceeded. The three gases causing the most damage to vegetation are carbon monoxide, the sulfur oxides, and those containing fluorine. Also to be considered are acid "smog", toxic "smog", ozone, and nitrogen oxides. Other industrial pollutants which have a toxic influence, but less sever and localized, are dusts, hydrogen sulfides, hydrochloric acid, etc. Ethylene and carbon monoxide cause great damage to the growth hormones, particularly auxin. The effects of SO2, SO3, and H2SO4 are related to the quanity of gas emitted, the degree of resistance of the species, their state of development, and the various environmental conditions. The sensitivity of vegetation to the action of sulfur gases varies essentially as a function of the speed of absorption of the gas by the leaves. Through experimentation it has been found that the plant species which are most sensitive to SO2 are chickweed, alfalfa, barley, oats, wheat, rhubarb, lettuce, endive, spinich, cabbage, and tobacco. Apples, apricots, peaches, grapes, corn, and beans are less sensitive, whereas the floral species such as gladiolus, rose, and lilac offer considerable resistance. Aquatic vegetation is often used as purifying means for polluted streams. Subsoils purify themselves of pollutant materials in various ways, including uptake by vegetation and dispersion in the soil with rain water, etc. In a section on means of decreasing the inhaled pollutants the following are mentioned: dust collectors, normal methods of dispersion in the atmosphere, fumes from domestic fires, auto exhaust fumes, fuel additives, improvement of combustion in engines, recycling of crankcase gases, post-combustion appliances, and redesigning of motors. Also given in this section (Chapter 3) is some similar information on ingested pollutants and on problems of noise.##

05871 114

K. T. Semrau

EMISSION OF FLUORIDES FROM INDUSTRIAL PROCESSES - A REVIEW.
J. Air Pollution Control Assoc. 8, (2) 92-108, Aug. 1958.
(Presented at the 130th Meeting, American Chemical
Society, Atlantic City, N.J., Sept. 1956.)

Fluorine contaminants may be emitted to the atmosphere by a wide variety of industrial processes in which fluorine compounds are manufactured, utilized as catalysts or fluxes, or are present as impurities in the process materials. In some cases, the possibility of contamination is obvious, and control measures are generally provided as a matter of course. These include manufacture of HF, use of HF as an alkylation catalyst in the manufacture of motor fuels, and use of elemental fluorine. However, some of the most serious cases of pollution have arisen from processes in which fluorine compounds are used as fluxes or are present as impurities. In some instances, the fluorine has been present in the process material in a concentration so low that its presence was not considered to constitute a potential problem, or perhaps was not even recognized. Fluorosis in cattle, or damage to vegetation, ahs occurred primarily in the vicinity of plants manufacturing phosphate fertilizers, aluminum, brick, enamel frit, and iron and steel. MacIntire considers that the most important sources are probably the manufacture of phosphate fertilizers, aluminum, and steel. Thermodynamic considerations and a review of the literature indicate that the principal mechanism of liberation of fluorides in high temperature processes is pyrohydrolysis, which results in formation of HF. The principal variables in pyrohydrolysis in most industrial processes appear to be the equilibrium of the reaction, the water vapor concentration in the process atmosphere, and the factors determining mass transfer. Reaction rates appear to be generally high, although little information is available. Significant formation of SiF_4 appears to be limited to cases involving thermal decomposition of fluosilicates or reaction of fluorides and silica with acids at relatively low temperatures. Formation of volatile metal fluorides may be a significant mechanism of liberation in some cases, but is generally of less importance than pyrohydrolysis. By analogy to known cases, it should be possible to make order-of-magnitude estimates of the probable fluorine emissions from a given process if the quantity of input fluorine is known or can be estimated.##

EFFECTS - MATERIALS

16404 **115**

Barton, K. and S. Bartonova

MECHANISM OF THE CORROSION OF FE, ZN AND CU IN A HUMID ATMOSPHERE CONTAINING HCL VAPORS. (Mechanismus der Fe-, Zn- und Cu-Korrosion in feuchter HCl-Daempfe enthaltender atmosphaere). Text in German. Collection Czech. Chem. Commu. (Prague), 32(7):2431-2438, 1967. 6 refs.

Steel containing a small amount of carbon, electrolytic zinc, and electrolytic copper in the form of thin plates 30 by 80 mm with a thickness between 0.8 to 1 mm were used to study the corrosion mechanism at temperatures of 20, 30 and 40 C; a relative humidity of 80%; and an HCl content of 0.0007 to 0.002% (by volume). The stationary state characterized by constant quantity and composition of the corrosion products and a linear dependence of the corrosion on time was established. After the stationary state had been reached, the corrosion kinetics iron were goverend by HCl formation during the rust development. With the zinc sample, the corrosion speed decreased after the stationary state had been reached. This was due to a reaction of the hydroxide and the alkaline zinc chloride with HCl, where soluble $ZnCl_2$ is formed. The speed of this process is influenced by the transport of the gaseous HCl to the boundary atmosphere/corrosion product, as well as by the adsorption and composition of the product. With the copper sample, the decisive partial process of the corrosion kinetics in the stationary state was the destruction of the CuCl layer covering the Cu_2O layer. The process is likewise determined by the transport of the gaseous HCl to the boundary atmosphere/corrosion product, by the HCl adsorption, and the composition of the product.

17775 **116**

Binger, W. W., R. H. Wagner, and R. H. Brown

RESISTANCE OF ALUMINUM ALLOYS TO CHEMICALLY CONTAMINATED ATMOSPHERES. Corrosion, 9(12):440-447, 1953. 15 refs. (Presented at the Ninth Annual Conference, National Association of Corrosion Engineers, Chicago, Ill., March 16-20, 1953.)

Of the many factors connected with atmospheric corrosion problems in chemical plants, refineries, and other industries, those encountered most often are combinations of hydrogen sulfide, carbon dioxide, sulfur dioxide, hydrogen chloride, moisture and dirt. In general, it has been found that aluminum alloys are resistant to atmospheres containing these contaminants. In addition, the problem in most plants is further aggravated by the formation of dust and/or fumes. An active laboratory as well as field testing program is continuing to demonstrate that aluminum alloys of the type used for architectural applications are very resistant to corrosion by a wide variety of organic and inorganic chemicals. The use of aluminum-base alloys in the coke, soda, ash, sulfur, power, paper, salt, petroleum and petrol-chemical industries has reduced corrosion losses with resultant savings in maintenance costs. Some of the applications where aluminum alloys have proved successful are tank roofs, siding, roofing, windows, duct work, ladders, handrail, instrument tubing, and tread plate. It is believed that through cooperative field testing it will be possible to demonstrate many additional applications in these and other industries where aluminum alloys can be used to advantage. A sound, practical installation can best be obtained by taking advantage of all the information and experience that is readily available. (Author abstract modified)

15657 **117**

Fink, Ferdinand

THE COMBUSTION OF DOMESTIC REFUSE CONTAINING A HIGH PROPORTION OF SYNTHETIC MATERIALS. (Verbrennung von Hausmuell mit hoeheren Kunststoffanteilen). Text in German. Brennstoff-Waerme-Kraft, 21(9):472-476, Sept. 1969. 8 refs.

The domestic refuse in the city of Zurich contained 1.1 to 2.7% by weight of synthetic material in the years 1963 and 1964, as compared with other large cities where it contained 4 to 5%. In Germany, half of the synthetics in domestic refuse are composed of polyvinyl chloride (PVC). The relatively low PVC fraction in the waste causes corrosion problems. Polyvinyl chloride begins to melt at 120 C; at 200 C, it begins to separate. It has a heating value of 6000 kcal/kg; the ignition point is 460 C. Domestic refuse is incinerated with a large amount of excess air. The heterogeneous waste composition causes a fluctuating combustion process. Thus, the waste gas composition varies as follows: 7 to 11% by volume CO, 10 to 16% water vapor, 6 to 10% oxygen, and 0.2 to 1.0 g/cu m HCl. Varying gas composition and fluctuating temperatures damage the oxide layer on the steel pipes. There are two types of corrosion: sulfate corrosion and chlorine corrosion. It is generally thought that sulfate corrosion is due to alkali pyrosulfates which, when superheated, yield activated SO3. The latter substance is highly corrosive. Chlorine corrosion is due to the presence of HCl. In oxidizing waste gases, HCl attacks only metal; in reducing waste gases, iron oxide and dust incrustations may adsorb HCl, which is liberated again at higher temperatures. The chlorine gas and the HCl which develop in this manner are both highly corrosive after desorption. To prevent chlorine corrosion, large amounts of water vapor must be present in the waste gas. Injection of water into the combustion chamber helps to fulfill this demand. Furthermore, reducing components in the waste gas must be avoided. The temperature at the pipe wall should never exceed 400 C.

19325 **118**

Konda, Kiyoshi, Hisao Ito, and Atsuhiro Honda

FIELD EVALUATION OF EXHAUST GAS FROM REFUSE INCINERATOR RELATED TO AIR POLLUTION AND METAL CORROSION. Trans. Soc. Heating, Air-Conditioning, and Sanitary Engrs. (Japan), vol. 7:95-104, 1969.

A study of municipal incinerator exhaust gas composition conducted at five sites in Japan is described. The study was undertaken to obtain information on odor and metal corrosion problems. The exhaust consisted of sulfur oxides, nitrogen oxides, ammonia, sulfuric acid, nitric acid, organic acids, and hydrochloric acid. Volatile organic acids and hydrochloric acid are mainly responsible for the corrosion, with sulfuric and nitric acids only partially concerned. Percentages of exhaust products as a function of raw refuse input are tabulated. Continuous firing rather than batch firing would limit noxious effluents. Temperature and excess air control would also help. After-burning chambers should be installed to further reduce contaminants.

16081 **119**

Laengle, Erwin

INVESTIGATIONS OF THE CORROSION-CAUSING PROPERTIES OF VOLATILE ACIDS AND ANHYDROUS ACIDS. (Untersuchungen ueber die metallangreifenden Eigenschaften von fluechtigen Saeuren und Saeureanhydriden). Text in German. Eidgenoessische Technischen Hochschule, Zurich, Switzerland, Thesis (PhD), 1968, 43p. 64 refs.
CFSTI: N69-32307

The corrosion resistances of iron, zinc, aluminum, copper, and lead to chemical attacks from hydrochloric acid, hydrogen sulfide, formic acid, acetic acid vapors, and sulfur dioxide atmospheres were studied. Emphasis was placed on the problems of critical vapor humidity, analytic determination of corrosion products, and the reaction mechanisms. Metal samples were briefly exposed to dry or moist acid vapors during the introductory period and subsequently kept for a longer time in an acid-free atmosphere of differing moisture levels. Results showed that the metal surface was initially attacked in by the formation of a dry or humid saline crust which liquefied through atmospheric water absorption and attacked the metal surface by deoxygenation. Pronounced reactions were observed on iron and zinc surfaces, but the other metals proved relatively corrosion resistant. (Author abstract)

13877 **120**

McLeod, W. and R. R. Rogers

CORROSION OF METALS BY AQUEOUS SOLUTIONS OF THE ATMOSPHERIC POLLUTANT SULFUROUS ACID. Electrochem. Technol., 6(7 to 8): 231-235, July to Aug. 1968. 7 refs.

The corrosion rate of a metal in an acid with a normality between N/1 and N/10,000, such as H2SO3, HNO3, H2SO4, or HCL, was found to be related to the concentration of the acid in accordance with the equation Corrosion rate equals a x (Acid Normality) to the b power, where a and b are constant for each combination of acid and metal and where temperature is 25 C. By determining the values of a and b for a number of acid-metal combinations, it was possible to compare the corrosion rates of the various metals in sulfurous acid with those of the same metals in nitric, sulfuric, and hydrochloric acids, and to determine the corrosion rate of the metals in sulfurous acid of different normalities. Data obtained show that nonstainless steel, with or without nickel, is highly susceptible to sulfurous acid corrosion. However, when a substantial proportion of chromium is present in an alloy which contains nickel, steel is free from corrosion by either sulfurous acid or nitric acid. Copper and chromium are not appreciably susceptible to sulfurous acid corrosion in solutions lower than N/1.3. Tin corrodes more rapidly than other nonferrous metals between N/100 and N/1000, but less than cadmium and zinc at N/10. Cadmium, Lead, and zinc corrode more rapidly in sulfurous acid than in nitric acid. Lead corrodes less rapidly in sulfurous acid than in nitric acid. Aluminum is rapidly corroded by hyperchloric acid but less so by nitric or sulfurous acid. The study concludes that sulfurous acid solutions causing the greatest damage in urban and industrial areas have abnormalities between N/1 and N/10,000.

06601 121

H. C. Muffley

INFLUENCE OF ATMOSPHERIC CONTAMINANTS ON CORROSION - LITERATURE
REPORT. Rock Island Arsenal, Ill. (Rept. No. 63-2041.)
23 pp. (June 13, 1963). DDC: AD 420 118
DDCI AD 420 117

The influence of atmospheric contaminant gases and particulate matter upon the corrosion rates of ferrous and nonferrous metals is investigated. Various means of protection from, or elimination of, such corrosive environments are reviewed. Variations in the rate of corrosion coincide with the severity of atmospheric pollution in different locations where average humidity is approximately the same. Because of this interaction of the various pollutants and moisture, and the fact that these vary independently, it is difficult to predict the corrosion behavior of a location. It has been observed that the corrosiveness of a given atmosphere is not constant, but varies with the weather conditions. Some areas will show a difference in the corrosion of specimens put out at different seasons of the year. Data from the tests in both industrial and marine atmospheres, reveal that very great differences in corrosivity can exist at locations only a few miles apart, or, in some extreme cases, only a few 100 feet apart. The corrosion rates of various metals or alloys for various environmental conditions are given. Corrosion of metals can be overcome 1) by eliminating the contaminants that cause corrosion of metal parts, 2) by preventing the contaminants from coming in contact with the metal surface, and 3) by using a metal finish that will be resistant to the specific atmosphere.

12055 122

Nowak, F.

CORROSION PROBLEMS IN INCINERATORS. Combustion, 40(5):32-40, Nov. 1968.

The state of the art of corrosion in incinerators is reviewed. While at first glance there seems to be no great difference between an incinerator whose generated heat is being used for steam generation and a boiler fired with conventional fuel, in fact many more problems are encountered due to the heavy deposits, more frequent outages, and gas-side corrosion of heating surfaces. Due to the nonhomogeneous nature of the waste materials and the corrosive components in the flue gas which are steadily increasing with the increase in plastics and other industrial wastes fired, control of conditions in incinerators is difficult. Some examples of corrosive experience and some approaches to control of the problems are discussed.##

06038 123

P. W. Sherwood

HOW ATMOSPHERIC CONDITIONS CAN CORRODE REFINERY EQUIPMENT. Erdoel Kohle (Hamburg) 19(4):289-290 (April 1966.) Ger. (Tr.)

Atmospheric corrosion of refinery equipment from the effects of humidity, dusts and electrolytes is reviewed. Effect of humidity: Although water vapor contributes to the mechanism of atmospheric corrosion, the principal offender is water which precipitates in liquid form from saturated or near-saturated air. An oxidation-reduction potential may be built up between two surfaces which promotes corrosion. Electrolytes dissolved in the water will increase corrosive action. Enclosed storage and humidity control are two approaches which can be used to counteract some of these situations. Effects of dust: These are probably not significant unless the dust consists of a salt or other kind of electrolyte. Effects of oxidants and electrolytes: Oxidants cause serious corrosion only in the presence of liquid water. Acidic materials are seen to be the worst corrosive agents in the atmosphere. Salts are strong electrolytes and in the presence of liquid water they will contribute to rusting of materials. Alkalies are not considered a serious problem in atmospheric corrosion; strong alkalies deposited in the presence of liquid water can cause deterioration of aluminum or zinc.##

02774 124

V.B. Volkening

PERFORMANCE OF COATING ON METAL IN AN INDUSTRIAL ATMOSPHERE. Preprint. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-86.)

The reason and methods of procedure for a protective coating testing program are discussed. Results based on fifteen years operation of such a program in a chemical plant on the Gulf Coast are described - some in detail. Atmospheric contaminants from high humidity and moisture condensation to chlorine and hydrochloric acid were encountered. A method for calibrating the atmosphere is outlined. Differences in the performance of several generic types of coating resins are presented. Generous references to the literature are included. (Author abstract)##

EFFECTS - ECONOMICS

21749 125

Weidensaul, T. Craig and Norman I. LaCasse

STATEWIDE SURVEY OF AIR POLLUTION DAMAGE TO VEGETATION - 1969.
Pennsylvania State Univ., University Park, Center for Air
Environment Studies, PHS Grant AP 00002, 1970, 52p. 3 refs.

During the summer of 1969, a statewide survey of air pollution damage to vegetation was conducted to assess economic losses incurred on food and fiber crops in Pennsylvania. Most incidents occurred in areas of greatest agricultural activity. The greatest economic losses were observed on vegetable, fruit, and agronomic crops, followed by lawns, ornamentals, greenhouse flowers, and forest trees. The suspected major pollutants, based on associated economic losses, appear to be as follows: oxidants, sulfur oxides, lead, hydrogen chloride, particulates, herbicides, and ethylene. The total amount of direct economic loss was estimated to be more than 3.5 million dollars. Indirect losses accounted for an additional 8 million dollars. These losses include known profit losses to growers, costs of reforestation of denuded land, known greater relocation costs, and substitution of lower value crops for higher value ones. Other indirect effects are stream silting, erosion, farm abandonment, and loss in aesthetic values. (Author abstract modified)

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LEGAL AND ADMINISTRATIVE

00311 126

AIR POLLUTION (A SURVEY OF EXISTING LEGISLATION). Intern. Digest Health Legislation 14, 187-229, 1963.

This report contains a comparative survey of existing legislation for the control of atmospheric pollution, and discusses specific laws and regulations of following countries: Australia, Belgium, Canada, Chile, Czechoslovakia, France, Federal Republic of Germany, Ireland, Jamaica, New Zealand, Poland, England and the United States.##

17472 127

Duemmler, Friedrich

THE ANTI-AIR POLLUTION ACTIVITIES OF THE TECHNISCHE UEBERWACHUNGS-VEREIN. (Die Technischen Ueberwachungs-Vereine im Dienste des Immissionsschutzes). Text in German. Tech. Ueberwach (Duesseldorf), 10(10):339-345, Oct. 1970.

One of the most important tasks of the Technische Ueberwachungs-Verein (TUV) is to measure dust emissions by steam plants. By checking the performance of new measuring units and determining whether they fulfill the manufacturer's specifications. Measurements by the TUV taken in 1967 on steam boilers with capacities of up to 25 t/h showed that plants without dust collectors emitted on the average 560 mg dust/cu m; those with dust collectors, 170 mg/cu m. For plants with more than 100 Gcal/h, the authorities require the installation of automatic measuring devices for dust and sulfur dioxide. In this connection, TUV checks the available units for suitability and calibrates each individual unit. For dust measurements, photometric units were suitable; for SO2 measurements, infrared absorbers and electroconductivity analyzers were selected. In addition to these activities, TUV is presently engaged with fluorine, hydrocarbon, hydrogen sulfide, sulfur trioxide, carbon monoxide, hydrogen chloride, lead, and zinc oxide measurements. In the years 1965-1966, TUV conducted extensive studies of CO and CH content of automobile exhausts in the idling stage. Infrared absorbers were used for the measurements. Ten percent of the vehicles with four-stroke engines emitted more than 8% CO in the idle; but 45% of the vehicles emitted less than 4.5%. Beginning with October 1, 1970, newly registered automobiles with Otto engines may not emit more than 25 g CO and 1,5 g CH per 100 g fuel consumption. TUV will check the new automobiles for compliance with this law. Finally, odor and noise measurements also belong to the activities of the TUV.

17188 **128**

Hashimoto, Michio

STATUS OF AIR POLLUTION BY NOXIOUS AND OFFENSIVE GASES AND THEIR CONTROL PROGRAMMES. (Yugai gasu to niyoru osen no genjo to sono taisaku ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):441-444, Aug. 15, 1966.

A procedure for the adequate control of noxious gases, some of which are not yet covered by legislation, is discussed. Though dust fall is decreasing as a consequence of regulatory control, noxious and offensive gases are increasing in many industrial areas. The Labor Standard Law of 1947 provides for the control of working environments in the interest of worker health, but is no longer consistent with the present state of industrial pollution which poses a hazard for persons living in the vicinity of plants. The 1948 law regulating agricultural chemicals is concerned only with preventing injuries to people and livestock caused by the unrestricted use of chemicals; it does not consider the contribution of the chemicals to air pollution. High pressure gas control, fire prevention, mining, and other laws are subject to the same criticism. What is characteristic of these control laws is that they do not specify total noxious gas emission nor the relationship between a gas and its effect. The Smoke Dust Control Law is intended to compensate for these shortcomings; it now deals with sulfurous gas, anhydrous sulfuric gas with hydrogen fluoride, hydrogen sulfide, selenium oxide, hydrogen chloride, nitrogen dioxide, sulfur dioxide, hydrogen cyanide, carbon disulfide, ammonia, phosgene, and silicon tetrafluoride. More offensive gases are to be covered by the law.

07597 **129**

Heller, A.

MAXIMUM PERMISSIBLE CONCENTRATIONS FOR AIR POLLUTION IN THE FEDERAL REPUBLIC OF GERMANY. Preprint, Federal Inst. of Hygiene for Water, Soil and Air, Berlin, Germany, 10p., 1963. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963, Paper No. WHO/AP/8.)

An advisory committee set up by the Federal Government gives expert advice on the proposals of the Clean Air Commission of the Association of German Engineers regarding permissible emissions as well as on the maximum concentrations of "immissions" - the MIK values - for various air pollutants. The task of the Verein Deutscher Ingenieure Commission is to set scientific and technical bases for appropriate air pollution control measures. The main task of the Commission is to draft recommendations for new technical regulations as a basis for the determination and control of air pollution, as follows: Minimum requirements regarding the concentration and precipitation of dusts and gases in the atmosphere, bases for calculating the distribution of dusts and gases and for determining the required height of chimneys, limits to the emission of dust and gas from sources of air pollution, and procedures for measuring dusts and gases. The provisions recommended for examining applications for licences to establish new plants or to alter existing plants are reviewed. Enforcement of these regulations will depend on the local situation, especially the existing pollution load. They will also depend on the extent to which further pollution could occur, without exceeding the tolerance limit or the MIK-value for the most sensitive among the reaction partners, whether human being, animal or plant, and on the technical processes of the industrial plant in question. In principle, all reasonable technical and economic possibilites for purifying waste gases should be exploited in equal fashin by similar industrial plants. Finally, industry should be prepared to bear more far-reaching demands regarding waste-gas removal, if a licence for a new industrial plant or for the extension of an existing plant is to be issued in an area already polluted. MIK-values have been set and are discussed for; sulfur dioxide, hydrogen sulfide, some nitrous gases and chlorine.##

09687 130

R. Sutton

AIR POLLUTION IN PETROLEUM REFINING. Chem. Process Eng., 49(1):36-38, Jan. 1968. 9 refs.

The statute law relatint to air pollution is wide in coverage but not too onerous in its requirements. The author discusses common law as it affects the pollution of air, and considers in detail the two statutes applicable in petroleum refining-the Alkali and the Clean Air Acts.##

09285 131

H. Wolozin

FEDERAL FISCAL POLICY IN AIR POLLUTION CONTROL. (PREPARED DISCUSSION.) Preprint, Massachusetts Univ., Boston, Dept. of Economics, 4p., 1966 (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 12-14, 1966.)

Important questions to consider in determining policies on air pollution are how much is presently known about polluted air, how extensive are damages and whether the damages are progressive and irreversible. Policy recommendations would be different if time were not of the essence and damages were remediable. Measurement techniques are confined to direct effects of high levels of contamination. It is recommended that priority be given to research on measuring indirect and insidious effects of low level exposures of long duration. The air pollution problem poses the need for serious considerations of alternatives to influence management decisions. Research is required to determine if effective control will not ultimately demand basic modification of traditional government-industry relations. It is recommended that air pollution authorities be given the authority and resources to pay for air pollution filtering and control devices or bear the cost of modifying existing equipment. In return authorities would receive the right through public commissions to participate in corporate decisions affecting emission of pollutants.##

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STANDARDS AND CRITERIA

00411 132

K. Horn

(THE PROBLEM OF HYGIENICALLY PERMISSIBLE LIMITING CONCENTRATIONS OF AIR POLLUTION.) Zur Frage der Hygienisch zulassigen Grenzkonzentrationen fur Luftverunreinigungen. Angew. Meteorol. (Berlin) 5 (Special Issue) :39-43, 1965. Text in Ger.

The problem of determining permissible limits of air pollution is discussed. After listing four categories of pollution ranging from decreased visibility and injury to sight and smell to acute illness and possibly death, the aurthor states that pollution should be kept below the limits of the first category. He distinguishes between limits permissible in a factory area and in a residential area, the first being higher. Permissible limits for 40 chemicals established in 1963 for single occurrences and average 24 hour concentrations for East Germany are tabulated.##

06778 133

(INDUSTRY AND ATMOSPHERIC POLLUTION IN GREAT BRITAIN.) Industrie et pollution atmospherique en Grande Bretagne. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris, France. (1967.) 6 pp. Fr. (Rept. No. CI 310.) (C.I.T.E.P.A. Document No. 24.)

A summary of the basis of governmental action in Great Britain in the struggle against industrial emissions is outlined. The regulations imposed by the "Alkali Act" are in most cases based on "the most practical means." Standards are given for chimney heights. Statutory limits are given for various materials emitted such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen sulfide, chlorine, arsenic, antimony, cadmium, and lead. The construction of tall buildings tends to reduce the benefits obtained by tall chimneys. A better knowledge of the effects of pollutants should be obtained so as not to burden industry with unnecessary expense in their control. It is urged that international standards for emission be adopted.##

09259 134

Katz, Morris

RECENT DEVELOPMENTS IN AMBIENT AIR QUALITY GUIDES IN RELATION TO CONTROL OF ATMOSPHERIC EFFLUENTS. Pulp Paper Mag. Can.

(Gardenvale), 69(4):60-66, Feb. 16, 1968. 11 refs. (Presented at the 3rd Paper Industry Air Stream Improvement Conference, Vancouver, B.C., Oct. 23-26, 1967.)

Major sources of air pollutants are discussed, as well as the need for control of emissions using source emission standards and ambient air quality criteria. Criteria for air quality reflect the nature and magnitude of effects of air pollutants upon the atmospheric environment in general and on visibility, safety, health of man or animals, vegetation and property. These criteria state four levels of pollutant concentration and exposure periods according to the differing effects on the exposed population or receptors, rangin from no direct or indirect influence to symptoms that may be merely adverse, or serious, or of emergency proportions. Ambient air quality guides and standards adopted by several countries are tabulated for CO2, CL2, ethylene, HCl, H2S, oxides of nitrogen, ozone or oxidant, CS2, and SO2. Those of the State of California, State of New York, West Germany, Czechoslovakia, U.S.A., and the U.S.S.R., are reviewed. Air quality standards established in the U.S.S.R. are more stringent than those formulated in West Germany, the U.S.A. (California), and elsewhere. Maximum allowable concentrations for some atmospheric pollutants (industrial) in the U.S.S.R. are also tabulated, including As, CrO3, Pb, Mn, and soot. A brief summary is given of Canadian activities and the salient features of the Ontario Air Pollution Control Act. The existence of these standards implies that stricter measures will be enforced to control emission sources in the future.##

07197 135

RECOMMENDATIONS FOR ALLOWABLE CONCENTRATION (1966.) Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(4):62-66, 1966. Text in Japanese.

A report is given by a committee of the Japanese Association of Industrial Health on "Allowable concentration". The values of allowable concentration are worked out for a healthy man working 8 hr per day doing moderate work. Proper consideration must be given to cases in which more than 8 hr of exposure take place, more than one pollutant is involved, or the concentration of pollutants increases suddenly during the work schedule. Included is a discussion on dust measurement. It is important to measure dusts having a Stokes radius of less than 5 microns, especially at a height of 1 to 1.5 m from the ground. The relation between the source of dust and the point of measurement is illustrated.##

01916 136

V. A. Riazanov.

CRITERIA AND METHODS FOR ESTABLISHIHG MAXIMUM PERMISSIBLE CONCENTRATIONS OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 32, 389-98, 1965.

Experience in the USSR in establishing standards for air pollution control is described. It is emphasized that health considerations must be main criterion in deciding permissible concentrations, which constitute the "hygienic" standards ultimately to be achieved. Economic and technological reasons may dictate temporary "sanitary" standards, which modify the requirements for a limited period. "Technological" standards relate to the economic and technological consequences of air pollution and do not concern health. The maximum permissible concentrations of toxic substances used in toxicology and industrial hygiene are not sufficiently stringent for general use, and control standards are therefore based on the results of tests carried out on animals and human subjects. Tests on animals show that certain concentrations of toxic substances cause functional changes (e.g., in higher nervous activity, cholinesterase activity, and excretion of coproporphyrin) as well as a number of protective adaptational reactions. The results are used to establish maximum permissible concentrations of pollutants within a 24-hour period. Tests on human volunteers provide a basis for determining the maximum average concentrations at a given time. Reactions to odorous substances give the olfactory threshold and the level of concentration causing respiratory and visual reflexes, as well as subsensory effects such as changes in light sensitivity and in the activity of the cerebral cortex. Morbidity statistics also provide evidence of harmful pollution, but cannot serve as a basis for establishing maximum permissible concentrations, which should aim not only at preventing illness but also at avoiding pathological and adaptational reactions. (Author abstract)##

05940 137

V. A. Ryazanov

NEW DATA ON LIMITS OF ALLOWABLE ATMOSPHERIC AIR POLLUTANTS.

(In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 1-8. (1962). Russ. (Tr.)

This volume contains material discussed by the Committee on Sanitary Air Protection during its 1959 and 1960 sessions. The material contained in this volume is of heterogenous character in its methodological presentations and completeness and finality of the reports. The Committee took the position that the level of methodology reached during the last period of investigation and the degree of reliability of results obtained did not represent the acme of perfection, and therefore, the proposed limits of allowable concentrations should be regarded as mere points of orientation for future studies, leading to more basic, more scientific and hence, more reliable limits of atmospheric air pollutants. In this connection it is the aim and purpose of this Committee to act as the stimulator, guide and directing agent leading into investigational channels based on the outlined principles. Air pollutants studied include formaldehyde, HC1 aerosol, CS_2 vapor, Mn, Hg, combined Cl_2 and HCl gas, acetone, CO and Dinyl (mixture of diphenyl and diphenyl oxide).#

21078 138

Styazhkin, V. M.

EXPERIMENTAL BASIS FOR THE DETERMINATION OF ALLOWABLE CONCENTRATIONS OF CHLORINE AND HCL GAS SIMULTANEOUSLY PRESENT IN

ATMOSPHERIC AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:158-164, 1963. (B. S. Levine, ed.) CFSTI: 63-11570

An experimental basis for the determination of allowable concentrations for simultaneously present chlorine and HCl gas in the ambient air was obtained. Studies were conducted in the vicinity of a magnesium plant at 300, 500, 800, 1000, 2000, and 3000 m from the plant. Air samples were collected by the aspiration method through an absorber equipped with a porous plate No. 1. One absorber was filled with double distilled water; the other was filled with an acidified solution of methyl orange. Air samples collected through double distilled water were used for the determination of HCl aerosol by the titration method. Sulfuric acid, which interferred with analysis, was determined nephelometrically and subtracted from the titration result. Chlorine was determined colorimetrically in the sample. Results showed that chlorine and HCl gas concentrations were considerably in excess of the allowable maximal single concentration limit at all collecting points. The threshold of Cl odor preception was 0.7 mg/cu m and of HCl gas, 0.2 mg/cu m. Threshold odor perceptions of Cl and HCl gas simultaneously present in the air were established in the following combinations: 0.3 mg/cu m Cl, 0.1 mg/cu m and 0.2 mg/cu m Cl, 0.13 mg/cu m HCl. Results of the tests by the optical chronaxy method established the threshold of reflex effect of Cl and HCl gas simultaneously present in the air in the following concentration: 0.3 mg/cu m Cl, 0.2 mg/cu m HCl and 0.2 mg/cu m Cl, 0.3 mg/cu m HCl. The limit of maximal single concentration for Cl was 0.1 mg/cu m and for HCl, 0.05 mg/cu m. The simultaneous presence of Cl and HCl gas in the air in corresponding concentrations had no effect on the control curve of dark adaptation. Results showed that the concentrations were below the threshold of odor perception and reflex effect and below the allowable concentration limit.

BASIC SCIENCE AND TECHNOLOGY

13499 139

Bagliano, G. and L. Ossicini

THE ADSORPTION OF METAL IONS FROM HF-HC104 MIXTURES ON SOME ION EXCHANGE PAPERS. J. Chromatog., 21(3):499-502, March 1966. 2 refs.

A comparison of ion exchange from HF-HC1 and HF-HC104 mixtures for ions known to adsorb from these solutions is made using two types of anion and one cation exchange paper. The concentration of HC1 or HC104 was maintained constant at 1N and the HF concentration was varied from 1 to 10%. Experimental results show that, while there are considerable differences in adsorption from HF-HC1, very few ions were adsorbed from HF-HC104. Tantalum may be adsorbed from mixtures with Hf, Zr, Ti, Nb, Mo, W, and U on an anion exchange resin paper from HF-HC104.

16169 140

Baume, Georges

FREEZING POINT OF GASEOUS MIXTURES AT VERY LOW TEMPERATURES. (Sur le point de congelation des melanges gazeux a de tres basses temperatures). Text in French. Compt. Rend. 148:1322-24, 1909. 6 refs.

The gas mixtures studied were (CH3)2O-HCl, (CH3)2O-SO2 and (CH3)2O-CH3Cl. The freezing point curve of the first and 2 maxima, one at -94 C, the other at -102, corresponding to a mixture of one ether and 4 HCl. Solid ether + SO2 was obtained; temperatures were not given.

17716 141

Baume, Georges and Georges -P. Pamfil

QUANTITATIVE INVESTIGATIONS OF VOLATILE SYSTEMS: FUSIBILITY CURVES OF SYSTEMS FORMED BY HYDROCHLORIC ACID AND SULFUR DIOXIDE WITH METHYLALCOHOL; MECHANISM OF THE FORMATION OF ESTERS. (Recherches quantitatives sur les systemes volatils: Courbes de fusibilite des systemes formes par l'acide chlorhydrique et l'anhydride sulfureux avec l'alcool methylique; mechanisme de la formation desesters). Text in French. J. Chim. Phys., vol. 12:256-265, 1914. 25 refs.

The solidification of the following binary systems were determined: CH3OH-HCl; C2H5.CO2H-CH3OH, (C2H5CO2H.HCl)-CH3OH; (CH3OH.HCl)-C2H5CO2H; CH3OH-SO2; and SO2-HCl. The objective of these determinations was to obtain new confirmations on the mechanism of chemical reactions. The existence of the following, but unstable, intermediate addition compounds was established: a) CH3OH+HCl; b) CH3OH+C2H5CO2H+HCl; c) CH3OH+SO2; and d) 2CH3OH+SO2. Compounds a and b may be considered as the first stages of formation of the halogen derivatives of alcohols and esters. Moreover, compound b offers a particularly simple example of chemical catalysis by inorganic acids. In contrast with 'physical catalysts' which raise artificially and locally the temperature or pressure and thus create a state of affairs which an overall rise of temperature or pressure would produce without their intervention, 'chemical catalysts' form addition compounds with the substances whose mutual reaction they fercilitate or provoke. Compounds c and d solidifying respectively at about -71 C and about -81 C form a part of a system with a simple 'oxonian' phase diagram, in which they alternate with eutectic points at about -88 C at 45 mole % CH3OH, at about -91.5 C at 62 mole % CH3OH and at about -106 C at 89 mole % CH3OH. The SO2-HCl system has a simple eutectic point at -133.5 C at 80 mole % SO2.

05000 **142**

E. F. Berkau, G. T. Fisher, and M. M. Jones

THE INFLUENCE OF AXIAL DISPERSION ON THE FIXED BED ADSORPTION OF THE HYDROGEN CHLORIDE-CHROMIUM OXINATE SYSTEM. Preprint. 1964. 63 pp.

The results from a study of the removal of gaseous hydrogen chloride by the solid, metal organic complex, chromium oxinate, in a fixed-bed adsorption column is presented in the form of adsorption curves or exit gas concentration histories. These experimental curves are subsequently compared to the solutions of a theoretical mathematical model representing the adsorption process. The model incorporates axial diffusion, as described by G. T. Taylor. A gas phase mass transfer resistance and a solid phase adsorption-desorption rate were considered as the mechanisms for the adsorption model. The solutions to the mathematical model were generated by an analog computer. (Author abstract)##

17126 **143**

Braunstein, J. and M. Blander

THE THERMODYNAMICS OF DILUTE SOLUTIONS OF AGNO3 AND KCL IN MOLTEN KNO3 FROM ELECTROMOTIVE FORCE MEASUREMENTS. III. TEMPERATURE VARIATIONS OF THE ACTIVITY COEFFICIENTS. J. Phys. Chem., 64(10):10-13, Jan. 1960. 4 refs.

Activity coefficients and their temperature dependence as calculated from the quasi-lattice model of the molten reciprocal salt system A(+), B(+), C(-), and D(-), were tested by comparison with measured values of the activity coefficients of the component AgNO3 in the system Ag(+), K(+), Cl(-), NO3(-) dilute in Ag(+) and Cl(-) ions. Electromotive force measurements in a molten salt concentration cell were made at 385, 402, and 423 deg. KCl in solution lowered the activity coefficient of AgNO3; the decrease was directly proportional to the concentration of Cl(-) ions and inversely proportional to the concentration of Ag(+) ions. Results show that the temperature coefficients of the activity coefficients in the range of validity of the theory are correctly predicted, lending confidence in the usefulness of the quasi-lattice model. (Author abstract modified)

20189 **144**

Brockmeier, Norman F.

CHEMICAL REACTIONS INDUCED IN A MICROWAVE DISCHARGE.
Massachusetts Inst. of Tech., Cambridge, Dept. of Chemical Engineering, Thesis (Ph.D), 138p., Aug. 1966. 60 refs.

A suitable chemical system was determined for microwave discharge and the relationship was found between the microwave power and the chemical parameter. The chemical systems investigated included the reactions of hydrogen chloride with solid carbon or with hydrocarbon gases (methane, ethylene, or acetylene) and the oxidation of sulfur dioxide. The discharges were induced in a tubular quartz flow reactor, with energy supplied by a microwave power generator at fixed 2450 mc frequency with a continuous wave magnetron capable of 1200 watts output. The hydrogen chloride system did not achieve a reasonable conversion. However, 60% of the sulfur dioxide feed was oxidized with air at 300 C without using a catalyst. The conversion of the sulfur dioxide-oxygen feed was proportional to the concentration of various third gases, such as sulfur hexafluoride, carbon tetrafluoride, or nitrogen added to feed. The hypothesis that the termolecular collision O + SO2 + M yields SO3 + M was the rate-controlling step in the formation of sulfur trioxide was supported by experimental data. An energy balance of the reactor showed that the adsorbed microwave power was 50 times the power required to dissociate the oxygen consumed. These results applied over the entire range of conditions studied: pressure, 5 to 160 torr; power, 50 to 480 watts; and feed rate, from 90 to 300 cc/min measured at one atm and 21 C. The effectiveness of the third gas was directly proportional to its heat capacity and inversely related to the ease with which the third gas was excited by the discharge. (Author abstract modified)

09057 **145**

Carter, C. Neal

EFFECTS OF pH AND OXIDIZING AGENTS ON THE RATE OF ABSORPTION OF HYDROGEN SULFIDE INTO AQUEOUS MEDIA. TAPPI, 50(7):329-334, July 1967. 19 refs.

The rates of absorption of hydrogen sulfide into aqueous solutions of hydrogen chloride, sodium hydroxide, and sodium hypochlorite were measured by means of a laminar liquid jet. The effects of various reactions were determined by analyzing the data in terms of the penetration theory. The various reactions that were found to influence the rates of absorption determined in this study were an ionization reaction, which had a first order forward rate constant of 8.4 per sec; a neutralization reaction between hydroxide ions and hydrogen sulfide molecules, which had an "infinitely high" rate; and an oxidizing reaction, which had an "apparent" first-order rate constant of 250 per sec for a 0.1N hypochlorite solution. The data on the absorption of hydrogen sulfide into basic solutions indicate the possibility that the laminar jet and wetted-wall column do not give comparable results for cases of absorption accompanied by an "infinitely fast" reaction. Further analysis of the rates of absorption into oxidizing solutions indicates that hydrogen sulfide will react initially with the hypochlorite ions to form dihydrogen sulfoxide, which in turn will form unstable complexes with more hydrogen sulfide molecules by sulfur-sulfur bonds. The data also indicate that for oxidizing solutions above pH 12, the rates of absorption are influenced by the decomposition of dihydrogen sulfoxide, which gives hydroxide ions as a product. (Author's abstract)##

11108 146
Coleman, Paul D. and Roberto Roldan

ELECTRICAL PROPERTIES OF MATERIALS IN THE FAR INFRARED REGION. (FINAL REPORT 1 FEBRUARY 1965 - 31 JANUARY 1967.) ILLINOIS UNIV. Urbana, Electro-physics Lab., Contract AF-AFOSR-272-65, Proj. 9767-02 AFOSR-68-0465, 8p., (22) refs.
CFSTI: AD 669573

A vacuum monochromator for the 80 to 1000 micron range, under construction for the past year, is described. Initial data on the rotational spectra $HC1$, HBr, $N20$% $CH3C1$ and $CH3CN$ were taken to test the performance characteristics of the instrument. Performance data indicated that the monochromator characteristics are wavelength reproduction 0.1%; wavelength calibration 0.5%; relative intensity measurement 5 to 10%; and a resolution of 2% in the 300 to 700 micron range using a carbon bolometer detecter and a scan time of 1 hour. (Authors' summary, modified)

20274 147

Collins, Conrad G., Jr.

A REVIEW OF SULPHUR FLAME TECHNOLOGY. (PART 2). Sulphur Inst. J., 6(1):18-22, Spring 1970. 52 refs. Part I. Ibid, Winter 1969-70.

The encounter and reaction of sulfur dioxide with an oxygen atom appears to be the predominant mechanism for sulfur trioxide formation according to most studies of stack gases and the hydrogen sulfide flame. The mechanism can be important only in flames with high temperature (1200 C) zones for the formation of atomic oxygen, as at lower temperatures, the slow homogeneous reaction between $SO2$ and molecular oxygen appears to be a two body collision reaction. Catalytic action of nitric oxide for oxidizing $SO2$ to $SO3$ is questioned in lower temperature regions where $SO2$ would react only with molecular oxygen, but if high temperatures prevail, such that the oxygen atom concentration is appreciable, the catalytic effect of NO may be established. Experimental work with hydrogen chloride added to the flame (nucleophilic partner) yielded 38% $SO3$, and $HC1$ was viewed as a stabilizing medium for $SO3$. Different sulfur oxide species have been detected spectroscopically at a variety of conditions, from low temperature to the high temperature of shock waves.

14305 148

Conway, B. E., J. O'M. Bockris, and Hedda Linton

PROTON CONDUCTANCE AND THE EXISTENCE OF THE $H_3O(I)$ ION. J. Chem. Phys., 24(4):834-850, April 1956. 44 refs.

The conductance of HCl in nonaqueous and in aqueous-nonaqueous systems was studied and theoretical predictions were compared with experimental results. Five processes which could be rate determining in proton conductance in hydroxylic solvents were considered. Proton transfer between $H_3O(I)$ and H_2O by quantum-mechanical tunneling is faster than corresponds to the experimental anomalous conductance and faster than the maximum possible rate by classical proton transfers. Both transfer processes give too high a value of the H(I)/D(I) mobility ratio. Rotation of $H_3O(I)$ ions is not advantageous for proton transfers and reorientation of H_2O molecules is always necessary for successive proton transfers. Slow libration of H_2O and $H_3O(I)$ molecules, followed by proton transfer was considered, but this process gives the wrong direction of change of mobility from H(I) in H_2O to D(I) in D_2O, and also leads to a conductance faster than that corresponding to water rotation. Reorientation of H_2O molecules in the field of the $H_3O(I)$ ion was shown to be rate determining and the theory is supported by results of critical experiments on proton conductance in a series of alcohols and their mixtures with water. (Author conclusions modified)

21929 149

Cruickshank, F. R. and S. W. Benson

SOME THERMOCHEMICAL PROPERTIES OF METHYL VINYL ETHER, ALPHA-CHLOROETHYL METHYL ETHER, AND IODOMEHYL METHYL ETHER. EVIDENCE FOR NONBONDED ELECTROSTATIC INTERACTIONS. J. Am. Soc., 91(10):2487-2492, May 7, 1969. 20 refs.

The entropies of methyl vinyl ether and alpha-chloroethyl methyl ether were calculated, respectively, by statistical mechanical methods, and from the measured equilibrium constant. In the latter measurement, hydrogen chloride pressures were varied from 104.5 to 227.8 torr, and methyl vinyl ether from 28.57 to 213 torr. The heat of formation of iodomethyl methyl ether was calculated from the equilibrium constant and an assigned value for the entropy of the iodomethyl ether. Iodine pressures were varied 3.76 to 18.85 torr and dimethyl ether pressures from 39.62 to 592 torr. The temperature range was 515-631 K. Values obtained are consistent with an electrostatic interaction of the halogens with the terminal methyl group arising from the alternate polarity of bond dipoles. (Author abstract modified)

17888 150

Cupr, Vaclav

ABSORPTION OF HYDROGEN CHLORIDE GAS AND SULFUR DIOXIDE IN SULFURIC ACID AND ACETIC ACID. (Ueber die Absorption von Chlorwasserstoffgas und Schwefeldioxyd in Schwefelsaeure und

Essigsaeure). Text in German. Rec. Trav. Chim., vol.47:55-72, 1928. 33 refs.

The absorption isotherms in aqueous solutions of sulfuric acid at 25 C and sulfur dioxide at 20 C, have a minimum at 89 and 86% H_2SO_4, respectively, both of which lie close to the composition of the $H_2SO_4.H_2O$ monohydrate of sulfuric acid. To verify that the above minimum are due to the formation of the above monohydrate, extensive determinations of absorption isotherms of HCl and SO_2 in aqueous solutions of H_2SO_4 and CH_3COOH were performed, as well as in pure H_2O. The apparatus and the procedures used are described. The amounts of HCl, or SO_2, absorbed were determined by argentometric as well as iodometric titration, and are given in terms of grains of HCl, or SO_2, per 100 grams of the H_2SO_4 or CH_3COOH, aqueous solution. The absorption isotherms of HCl gas were determined in aqueous H_2SO_4 at C, -15.8 and -25 C in concentrations at which at the above temperatures the hydrates $H_2SO_4.2H_2O$ and $H_2SO_4.4H_2O$ do not precipitate; in aqueous H_2SO_4 with between 62 and 98% H_2SO_4 at 40 and 68 C; in 96% H_2SO_4 at six temperatures between 0 and 75 C; in aqueous CH_3COOH at 0 and 25 C; and in pure H_2O at C and 25 C. The absorption isotherms of SO_2 were determined in aqueous CH_3COOH at 27 C; in aqueous H_2SO_4 at 41 and 62 C; and in pure H_2O at 27, 41 and 62 C. The present results agree with those given in literature. The relationship between lowering the absorption capacity of the absorbent solution and the formation of the H_2SO_4 monohydrate is pointed out.

10672 **151**

Hersch, Paul A.

CONTROLLED ADDITION OF EXPERIMENTAL POLLUTANTS TO AIR. Gould-National Batteries, Inc., Minneapolis, Minn., 24p., 1968. 21 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul,Minn., June 1968, Paper 68-153.)

Experience with, and extensions of less known techniques of providing an air stream with a steady and adjustable level of a gaseous impurity are described. Leaving aside those means that employ moving solid parts, the paper discusses devices using liquid pistons, mikro-flow through channels, diffusion across channels and barriers, stream splitters for attenuation, and methods based on evaporation, electrolysis, chemical conversion, and irradiation. (Author s abstract, modified)

16071 **152**

Hexter, R. M. and T. D. Goldfarb

INFRA-RED SPECTRA OF QUINOL CLATHRATE COMPOUNDS. J. Inorg. Nucl. Chem., vol. 4:171-178, 1957. 21 refs. (Presented at the Symposium on Molecular Structure and Spectroscopy, Ohio State Univ., Columbus, June 1956.)

Inclusion complexes of Beta-hydroquinone clathrates with hydrogen chloride, hydrogen sulfide, carbon dioxide, and sulfur dioxide molecules were prepared to study restricted and translational modes of the molecules without resorting to low temperatures. Absorption and differential spectra from 1:1-15 micron were obtained by suspending samples in KBr pellets. The obtained spectra, which were investigated with spectrophotometers equipped with NaCL or KBR optics, are in agreement with a proposed difference in crystal structure between alpha-hydroquinone and its Beta allomorph. Spectra of HCl and H2S clathrates indicate that the guest molecules, while present in insufficiently small quantities for detection, profoundly change the quinol crystal structure. Examination of the 700, 800, and 1200 reciprocal cm regions of the SO2 clathrate spectrum demonstrate that the clathrate's crystal structure is that of Beta-hydroquinone. The most significant results were obtained with the CO2 clathrate; they suggest that this clathrate has the crystal structure of an alpha-hydroquinone, or a structure intermediate between the alpha and Beta forms, or that some alpha-hydroquinone is present as another phase. The observed maxima of the CO2 spectrum band are interpreted as wall-collison-broadened rotational lines of the Q branch of the parallel band of the captured CO2 molecule. The absence of P and R branches suggest that the rotation of the CO2 molecule in its hydroquinone clathrate is not free.

14313 153

Lederer, E. L.

VERIFYING ADSORPTION FORMULAS BY MEANS OF ADSORPTION MEASUREMENTS WITH ACTIVATED CHARCOAL. (Pruefung von Adsorptionsformeln an Hand von Adsorptionsmessungen bei einer hochaktiven Kohle). Text in German. Kolloid-Z. (Stuttgart), 61(3):323-328, 1932. 15 refs.

Data reported by Remy on the adsorption of gases and vapors on activated charcoal were used to verify isothermal and isobaric adsorption laws. In the isothermal case, no decision can be made between a logarithmic law and the formula of Langmuir. In the isobaric case, a logarithmic law seems to fit the results best. The isosteric curve of Trouton and Poole and the relationship of Gurwitsch fit the data only moderately well. The relationship between the vapor pressure and the adsorbed volume of various gases indicates that equal amounts of different gases are adsorbed, referred to corresponding states. Gas mixtures are adsorbed proportionally, provided the concentrations are modified by the influence of the mean molecular velocities and the shape of the molecules. The adsorption data for the following gases were used: CO2, N2O, HCl, H2S, NH3, Cl2, CH3Cl, SO2, CH4, and COCl2.

14132 154

Littlewood, R. and E. J. Argent

THE EFFECT OF AQUEOUS CONTAMINANTS ON THE REDOX POTENTIAL OF CHLORIDE MELTS. Electrochim. Acta, vol. 4:114-128, 1961. 8 refs.

The redox potential of a chloride melt contaminated with water is determined by the activities of its hydrolysis and dissociation products i.e., hydrogen ions, oxide ions, hydrogen, and oxygen. The effects of the changes in these products were studied by changing the partial pressures of HCl, H_2, or O_2 above the melt or by adding Na_2O to the melt. Experiments were carried out in equimolar NaCl-KCl at 700 C. Variations in O_2 partial pressure did not change the activity of the oxide ions. Stable redox potentials could not be obtained under low pressures of hydrogen. This suggested that under low pressures of hydrogen, the hydrogen-ion activity was continually rising. The effect of hydrogen-ion concentration suggests that true equilibrium of the melt with the gas phase was not obtained, and the measured potentials are a kinetic compromise between the composition of the gas phase and the equilibrium redox potential of the melt. The effect of oxygen-ion concentration indicated that changes in redox equilibria in the melt were occurring. The study indicated that attempts to change activity of one component of the melt by altering the composition of the gas phase or by making additions to the melt have brought about changes in the position of equilibria in the melt. Control of oxygen pressure would therefore be a definite way of controlling redox potentials of chloride melts, since the changes in redox potential could be accurately forecast. Hydrogen under low pressures corroded in the same way that a metal attempts to approach thermodynamic equilibrium in the melt by contaminating it with metal ions and ultimately becoming immune. The occurrence of this effect meant that attempts to reduce redox potential of a melt by varying hydrogen pressure would not be as good a control as varying oxygen pressure. The upper limit of the range of redox potential over which platinum behaved as a redox electrode was found to be - 0.4V on the standard chlorine electrode scale.

155

20932

Mueller, Robert F.

ENERGETICS OF HCL AND HF IN VOLCANIC EMANATIONS. Preprint, National Aeronautics and Space Administration, Greenbelt, Md., Goddard Space Flight Center, 32p., June 1969. 37 refs. (Paper NASA-TM-X-63608.)
CFSTI: N69-32034

Thermochemical data were used to calculate the fugacities of HCl and HF in equilibrium with halogen salts and crystalline silicates. The calculated fugacities were compared with the abundances of HCl and HF in fumarolic gases. Good agreement between the calculated values and the results of hydrothermal experiments were obtained. In the case of fumaroles, the abundances of HCl and HF molecules can be explained by assuming some undersaturation of the systems in such crystalline components as NaCl, $CaSiO_3$, and Al_2SiO_5. Also, the fumarolic gases gave evidence that high temperature abundances of HCl and HF are quenched to much lower temperatures recorded at the fumarolic vents. Numerous determinations of Cl and F in igneous and crystalline rocks showed that on the whole, F is more abundant than Cl. Igneous rocks and minerals are quite distinct from volcanic emanations in terms of the F/Cl ratios. The relations between HCl and HF and the structure of the silicate melt were also discussed. Although heterogeneous equilibria may be established at high temperatures between the the halogen gases and crystalline phases of the wall rock, the ultimate source of most of the halogens is the silicate melt. Although the structure of such melts is not well known, it is reasonable that both the decrease in liquidus temperatures and viscosity are attributable to reactions in which the Si-O-Si bridges are destroyed by the reaction with water. (Author abstract modified)

09034L 156

F. M. Page

A STUDY OF THE STABILITY OF GASEOUS NEGATIVE IONS. (FINAL TECHNICAL REPORT.) Aston Univ., Birmingham, England, Dept. of Chemistry, Contract DA-91-591-EUC-3870, Proj. 2001450B13B, ((136))p., Feb. 1967. 15 refs.
CFSTI: AD 822514

The modes of formation, occurrence, and in particular the stability of gaseous negative ions was determined by the magnetron technique. Included is a description of the apparatus used, the elementary theory of the method, and a comprehensive list of the stabilities of ions studied during the past three years.##

15496 157

Prokop'yeva, M. F. and V. K. Bukina

SELECTION AND TESTING OF SOLID CARRIERS IN THE CHROMATOGRAPHY OF CORROSIVE INORGANIC GASES. (Podbor i ispytaniye tverdykh nositeley v khromatografii agressivnykh neorganicheskikh gazov). Text in Russian. Uzbeksk. Khim. Zh., no. 4:51-53, 1967. 4 refs.

Studies were made with pumice, quartz, zeolite, porous teflon, Estonian mineral carriers K1 and K2, diatomaceous brick and, kieselguhr. The brick, kieselguhr, pumice, and quartz were subjected to boiling with hydrochloric acid (1:1) for 6 hrs. After washing to remove chloride ion, they were heated for 2-3 hrs at 900 C (pumice at 400 C). The other carriers were not pretreated. The criterion for inertness of the carrier was the retention time of the gaseous component relative to that of air. Distortion of the absorption isotherm was evaluated in terms of the Kestner coefficient of asymmetry. Pretreated brick, kieselguhr, and pumice revealed linear absorption isotherms for all components (CO_2, Cl_2, NOCl, HCl, SO_2) with the exception of NO_2, which is irreversibly absorbed. Teflon, K1, and K2 show linear absorption curves without preliminary treatment and are recommended for the analysis of gas mixtures containing NO_2.

14106 158

Ramirez-Munoz, J., M. Roth, and Maila Ostring

HYDROCHLORIC ACID SYSTEMS IN ATOMIC ABSORPTION FLAME PHOTOMETRY. Flame Notes, Beckman, 1(4):93-101, 1966. 6 refs.

Sensitivity and linearity of Na, K, Ca, Mg, Fe, Mn, and Zn were investigated as functions of element concentration, absorption profile, and acidity as applied to the preparation of acidic sample solutions for atomic absorption determination of these elements in samples such as cements, fertilizers, and clays. Analytical results were compared using aqueous and 0.5 N HCl standards. Instruments used were a Beckman Model 979 Atomic Absorption Spectrophotometer with a Beckman 10 in. Potentiometric Recorder and Laminar Flow Burner. In the special case of calcium, type of flame and the use of lanthanum as a releaser were also investigated. Results show that preliminary removal of acid before final dilution is not necessary as long as sample and standard solutions have the same acid content. The influence of the change from aqueous to acid solutions on both percentual and fluctuational sensitivity is demonstrated by experimental results given in two tables. The percentual sensitivity of Na, Ca, and Mn did not change appreciably, while slight changes were observed for other elements. In general, better fluctuational sensitivity was achieved with water solutions, except for Mg and Fe. The presence of acid tended to increase noise with the other elements. Highest sensitivity was usually found at heights between 0.2 in. and 0.5 in. over the top of the burner. Height of the burner was found to be critical for each element and should be rechecked when switching from aqueous to acid solutions. The method is deemed applicable to analyses in which these elements have to be determined in the presence of HCl up to concentrations equal to those tested (0.5 N HCl).

159

03947

B. G. Russell

FLAME-PHOTOMETRIC DETERMINATION OF SODIUM AND POTASSIUM IN MANGANESE ORES. Analyst (Cambridge) 91, (1085) 511-9, Aug. 1966.

Two procedures are described; in one, the sample is dissolved in hydrochloric acid, interfering elements are precipitated with 8-hydroxy-quinoline in ammoniacal solution, and the precipitate then extracted into chloroform. Sodium and potassium are determined in the aqueous phase by means of a filter flame photometer. The second procedure is more suitable for routine use and involves the dissolution of the sample in hydrochloric acid, followed by the addition of sulphuric acid and aluminium nitrate to suppress interferences, and the direct evaluation of the sodium and potassium contents of the solution by means of either a prism or a filter flame photometer. Comparative results obtained by this alternative procedure on instruments of these two types are given. (Author abstract)##

160

09594

Setser, D. W.

VIBRATIONALLY EXCITED 1,2-DICHLOROETHANA PRODUCED BY THE MERCURY PHOTOSENSITIZATION OF DICHLOROMETHANE. J. Am. Chem. Soc., 90(3):582-587, Jan. 31, 1968. 31 refs. (Presented in part at the Midwestern Regional American Chemical Society Meeting, Lawrence, Kans., Oct. 1966.)

The mercury photosensitization of dichloromethane has been examined as a prototype method for generating chemically activated alkyl halide molecules. It is shown that if the chlorine atoms are removed from the reaction system by a suitable scanvenger, then the measured nonequilbium unimolecular rate constant for HCl elimination from the chemically activated 1,2-dichloroethane formed by association of chloromethyl radicals agrees well with previously determined values. Some discussion of the reactions between the various chlorine-substituted alkyl radicals that may occur in the propene-inhibited system is presented. The chemically activated 1.3 -dichloro-2-methylpropane formed by association of chloromethyl and 1 -chloroisopropyl radicals does not undergo unimolecular reaction down to pressures of 2 mm. Calculated estimates for the HCl elimination rate constant from 1,3-dichloro-2-methylpropane support this observation; similar calculations were also done for n-chloropropane. (Author's abstract)

14879 **161**

Ukshe, Ye. A. and V. N. Devyatkin

DIFFUSION OF HYDROGEN CHLORIDE IN FUSED KCL-NACL MIXTURES. (Rastvoreniye khloristogo vodoroda v rasplavlennykh smesyakh KCl-NaCl). Text in Russian. Zh. Fiz. Khim., vol. 39:3074-3076, Oct./Dec. 1965. 4 refs.

Experimental data on the solubility of HCl in molten mixtures of NaCl and KCl are presented, and the calculated heat of solution is plotted. Solubility was found to increase as the KCl content of the melt decreased. Solubility decreased with temperature when the NaCl-KCl mixture was equimolar but increased with temperature in all other cases (0, 25, 75, and 100% NaCl). The heat of solution of HCl depends upon salt composition and exhibited a minimum for an equimolar mixture. It is proposed that the heat of diffusion varies with mixture composition in connection with a disruption of symmetry in the chloride lattice. Measurement was based on the displacement of HCl by argon using a method described in an earlier article.

14564 **162**

Ukshe, Ye. A. and V. N. Devyamkin

DIFFUSION OF HYDROGEN CHLORIDE IN FUSED SALTS. (Rastvoreniye khloristogo vodoroda v rasplavlennykh solyakh). Text in Russian. Zh. Fiz. Khim., vol. 39:2288-2291, July-Sept. 1965. 10 refs.

The solubility of hydrogen chloride in fused chlorides of lithium, sodium, potassium, and rubidium was examined over a wide temperature range by displacement with argon. Solubility curves are satisfactorily described by an exponential equation. Solubilities in the temperature range 800-1000 C occur in the increasing order: LiCl, NaCl, KCl, RbCl. Heats of solution were found to be negative for LiCl, NaCl, and KCl, and positive for RbCl. The heat of solution was found to be in inverse relation to the total crystalline ionic radii of the salts. It is suggested that proton-chloride complexes with a binding energy of about 53.5 kcal/mole are formed in the fused salts.

20041 **163**

Vasil 'eva, A. F.

PROBABLE EUTECTIC COMPOSITIONS OF CERTAIN HIGHLY VOLATILE SUBSTANCES. (O veroyatnom sostave evtektik nekotorykh legkoletuchikh veshchestv). Text in Russian. Zh. Obshch. Khim. vol. 49:432-441, 1917. 7 refs.

Theoretical and experimental data on eutectic composition and temperatures are tabulated for the following systems: ethane with sulfur dioxide, hydrogen chloride, methyl chloride, carbon dioxide, hydrogen sulfide, and ammonia; methyl alcohol with sulfur dioxide, methyl chloride, carbon dioxide, hydrogen sulfide, ammonia, and water; methyl chloride with hydrogen chloride; sulfur dioxide with hydrogen chloride; and ammonia with water.

17364 **164**

Wickert, K.

TESTS ON FORMATION OF FECL2 AND FECL3 BY REACTIONS BETWEEN FE, FE3O4, FE2O3 AND HCL-CONTAINING GASES. (Versuche zur Bildung von FeCl2 und FeCl3 aus Fe, Fe3O4, Fe2O3 und HCl-haltigen Gasen). Text in German. Mitt. Ver. Grosskesselbesitzer, 49(6):449-52, Dec. 1969. 5 refs.

The reaction of hydrogen chloride containing gases with pulverized Fe, Fe_3O_4, and Fe_2O_3 was studied with respect to temperature. Moreover, the influence of water vapor and oxygen in the HCl-containing gases on the reaction with the above mentioned substances was studied with respect to temperature. For each experiment, 0.3 g of the pulverized substances were heated in the presence of pure nitrogen. Each experiment lasted 4 hours. The HCl-containing gas (100 cu cm/min) was passed with a speed of 0.44 cm/sec through the reaction chamber at a temperature of 22 C. The reaction products were cooled to room temperature and the weight changes of the substances were determined. The reaction of Fe_2O_3 with N_2 containing 5% by volume HCl forms $FeCl_3$. The fraction of solid $FeCl_3$ decreases with increasing temperatures while the volatile $FeCl_3$ increases with the temperature. Below 320 C, volatile and solid $FeCl_3$ are formed. The reaction of Fe with the gas forms $FeCl_2$. Above 670 C, no solid $FeCl_2$ is found. Above 580 C, $FeCl_2$ is increasingly sublimated. The reaction with Fe_3O_4 forms $FeCl_2$ and $FeCl_3$. The former develops primarily at low temperatures. The maximum $FeCl_2$ formation takes place between 200 and 250 C. The $FeCl_3$ is sublimated at 300 C. The reaction of Fe_3O_4 with N_2 containing 10% H_2O and 5% HCl forms solid $FeCl_2$ up to 550 C. No reaction takes place between 550 and 700 C. Above 300 C, $FeCl_3$ and $FeCl_2$ form which are immediately converted to Fe_2O_3 through the influence of water vapor. The reaction with Fe forms no Fe_2O_3 only Fe_3O_4. Oxygen in the gas like the water vapor impairs the HCl reaction with Fe, Fe_2O_3, and Fe_3O_4. The presence of water vapor in addition to HCl form volatile and non-volatile chlorides but to a much lesser extend than in the presence of HCl alone in the gas. Oxygen further reduces chloride formation.

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